THE

MECHANICS' MAGAZINE.

MUSEUM,

Register, Journal.

AND

GAZETTE,

JANUARY 1st.—JUNE 25th, 1842.

VOL. XXXVI.

"To distinguish and present, as it were, in several columns, what is extant and already found, and what is defective and farther to be provided."

BACON.

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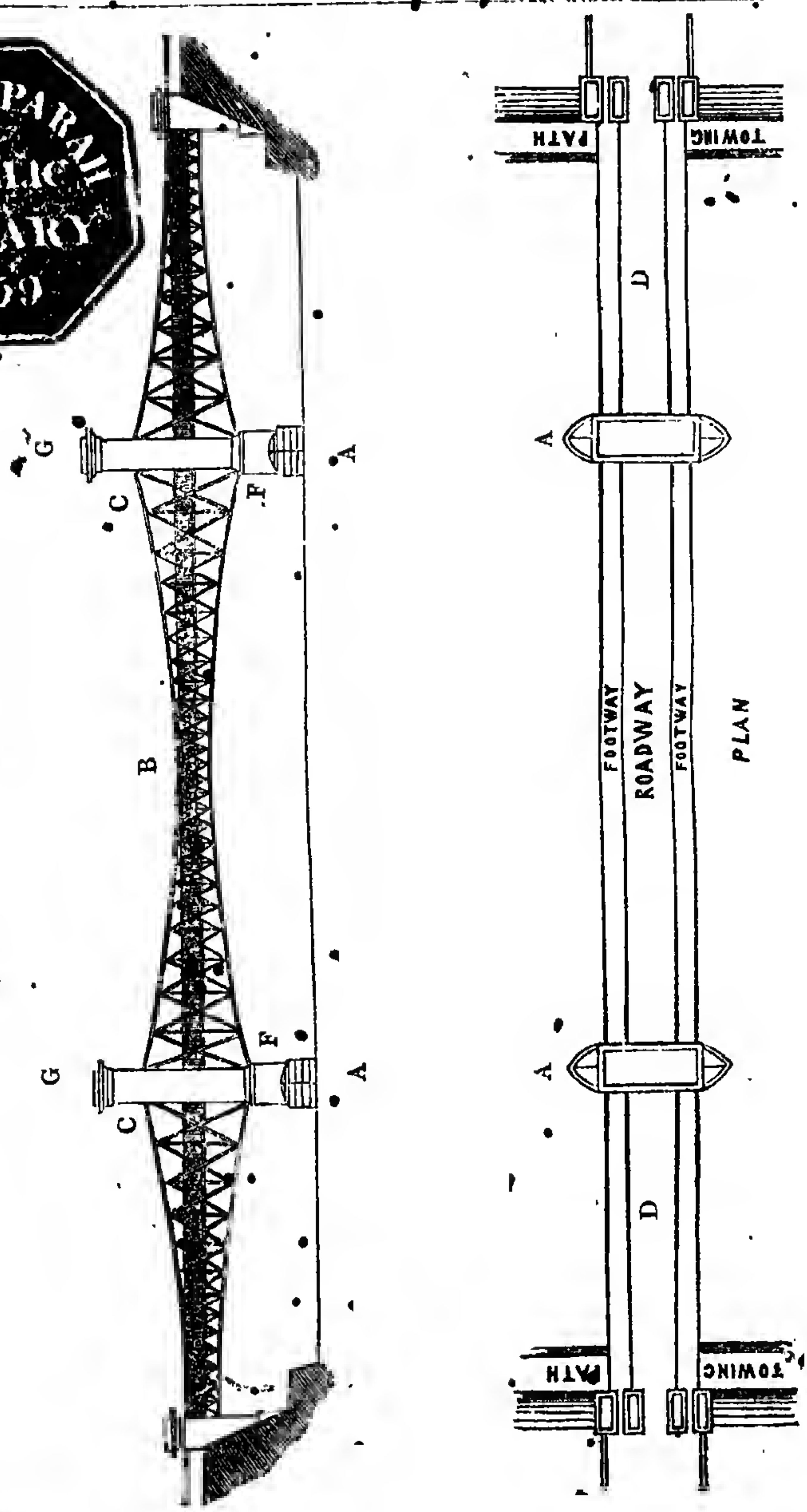

GIBBS'S IMPROVED SYSTEM OF BRIDGE BUILDING.

MR. GIBBS'S IMPROVED SYSTEM OF BRIDGE BUILDING.

We have already given a brief notice (No. 958, p. 490) of this system of bridge building, in our abstract of Mr. Gibbs's specification of certain patented improvements in roads, railways, &c., among which that system is included; but justice to the skill and ingenuity by which it is distinguished, and the many important advantages which it offers, requires that we should lay a more detailed and fuller account of it before our readers.

The master feature of this system is, that it combines in one, the best properties both of the common arc bridge, and the suspension bridge, without the worst of their respective drawbacks—the solidity and strength of the former without its abutments, and the lightness of the latter without its land ties. If there be no fallacy in the principles of construction followed by Mr Gibbs—and for ourselves we do not see any—it should follow, that if care be taken in adjusting the weight of the materials employed, a bridge built on this system will be so perfectly equilibrated, as to rest perpendicularly on its piers *without any out-thrust whatever.*

The engravings on our front page exhibits an elevation and plan of an entire bridge constructed on this plan. The following description of the details we extract from Mr. Gibbs's specification

"A A are the piers; B B the arches, which may be made of hollow iron tubes or of solid timber; C C are the suspending or main chains, or inverted arch; D D is the roadway, which may be fixed to the suspending rods; E E, rods which connect the two arches together; F F are what I call thrusting braces, which commence at the lower part of each pier, and are united to the first series of suspending rods at the junction of the inverted arch C C. Another series of braces G G, called the suspending braces, commence at the top of each pier at the place where the arches C C, on each side of the pier are connected together. These braces are connected with the suspending rods E E, at their junction with the lower arch B B. After the first set of portions of the arches are combined together, a second set can be added, precisely on the same principle as before described, each end of the bridge terminating with a half arch, and counterbalanced and resting upon the piers H H. It will be obvious, however, that the succeeding portions of the arches as they recede from the pier will have to sustain less weight than those nearer to the pier, and may accordingly be made lighter, commensurately with the load they will have to sustain. As many of these arches as may be required to form the width of the bridge, may be connected together by suitable horizontal and diagonal rods and braces. In some cases it may be of advantage to run the two arches through each other, which will permit a greater curvature to be given to the arches.

"The proportions of the different parts of the weights and nature of the materials to be used, and the mode of combinating them together at the joints will vary according to the character of the structure, and must be left to the judgment and skill of the engineer employed in each case."

PRACTICAL SUGGESTIONS FOR THE PROTECTION OF MANUFACTORIES FROM FIRE.

Sir,—Although I am very reluctant to obtrude my opinions on public notice, yet feeling most strongly the importance of the subject, and possessing the means, from *experience*, of affording information that may prove beneficial, I will hesitate no longer to offer, through the medium of your valuable columns, an explanation of the means I have long since adopted, with great advantage, to secure my premises and property from the calamity of fire. The frequent and awful conflagrations which have lately taken place, to the great injury both of public and private property, render it extremely desirable that some means should be taken to prevent a recurrence of them, if possible; and as the precautions about to be suggested have been attended with most beneficial results in my own establishment, I deem it proper to make them generally known, as I feel persuaded that many or most of the recent fires might have been arrested, if similar care had been taken.

I am the proprietor of an establishment where a number of workmen are employed amongst timber, shavings, linen, tow, oils, and where various articles of a combustible nature are used. To prevent an accident by fire, I have established several precautions One of these is, that under each work-bench,

throughout the premises, stands a pail of water, merely covered over with a loose wooden cover. Any workman whose bench is deficient of this at any time is liable to fine or censure; in fact, the order is peremptory, and is always obeyed. (I think the plan should be adopted in Her Majesty's dock-yards.) On one occasion my premises were saved by this means. A large bag of tow caught fire, from a candle being placed too near it, in the presence of four persons, two of whom were paralyzed with fear; the others caught up their pails of water, and subdued it in a minute. Had this not effected the object, there is a fire-pump in the yard, which would have been in action in three minutes more; for it is so constructed, that by merely screwing on a hose, or various lengths of hose, one person can pump, and another direct the hose. I consider this description of pump to be one of the most useful and desirable appendages to a large manufactory, nobleman's mansion, or public building, that can be imagined. All buildings require a pump of some kind; and wherever there is an opportunity of placing a pump *outside* the house or building, it should be of this construction. I have had my pump eleven years. The care generally taken has made it unnecessary to have recourse to it, except for common purposes, on my own premises; but the house of an eminent grocer, who lives within thirty yards of my premises, having caught fire in the basement story, where his carpenter, who had just left work, had been making packing-cases, my watchman, who is on duty every night, screwed on the hose, and breaking up the area grating, introduced it within less than five minutes after the alarm was given. In about ten minutes more, and before any other assistance arrived, the fire was so much subdued as to do very little damage, (40*l.* covered the loss;) whereas the house being in a very populous neighbourhood, abounding in old buildings, there is no knowing to what extent the mischief might have gone, had the fire not been stopped. Another precautionary measure I take is this: I have six strong bags made of common Russia sheeting, 1½ yard long, ¾ of a yard wide, with a strong tape run through the mouth of each, my name and address being stained outside. These bags are laid on a shelf in my counting-house, with strict injunctions that they are never to be used for any other purpose whatsoever, except that for which they are intended, namely, that in case of fire on my own or adjoining premises, the account-books and papers, or small articles, shall be instantly thrown into them, and removed to a place of safety in the neighbourhood. It is impossible to express the satisfaction you feel on having taken a precaution like this; but what it is *I know* from actual experience. A very alarming fire took place next door to my premises, to the destruction of four houses. I was absent sixty miles from London at the time; and on a certain morning, at ten o'clock, was surprised by the appearance of my coachman, who had rode down express to inform me of what had occurred; or, rather, to say that "a great fire was raging when he left, and it was feared my premises could not be saved." My first inquiry was, if my resident clerk was on the premises? The messenger replied, "Yes; and several of the men." My mind was then immediately set at rest, because I knew all the books and papers would be safe; and as the *stock and premises were insured*, no very serious loss could take place. I was thus enabled to return in quiet mind to London; where I found, as I expected, the books and papers all taken to my residence, in the neighbourhood, and not much damage done to the premises, though the adjoining four houses were burnt to the ground. At this time the fire-pump was not erected, or the whole might have been easily saved: of this there is no doubt whatever. To solicitors, merchants, public companies, and, in short, every person possessing papers of consequence, this precaution, the cost of which will not exceed 20*s.*, is invaluable.

Your inestimably useful publication, to which I have had the pleasure of subscribing for many years, appears to me the proper medium of disseminating a knowledge of these facts; and if you do not think the article too long for publication, the insertion will be esteemed a favour by, Sir,

Your humble servant,

A MANUFACTURER.

P.S.—The late Mr. Russel, of St. John's-street, Clerkenwell, made my pump, in 1830; but since his death, I

have permitted my neighbours, Messrs. Bailey, of 271, High Holborn, to take patterns from it, and authorized them to exhibit mine when required. The general efficacy of the thing consists in the ready, nay almost immediate application, in case of a fire, the hose being always at hand to screw on in a minute.

ON THE COMBUSTION OF COAL AND COKE IN FURNACES.—CARBONIC OXIDE.—BY C. W. WILLIAMS, ESQ.

Sir,—The facts communicated in the enclosed extracts from a letter which I have just received from New York, and from a gentleman who is a stranger to me, are so satisfactory, and involve so important a feature in effecting perfect combustion of the fuel in air-furnaces, that I hasten to give it the benefit of your extended circulation, and of pointing out its connexion with the subject on which I have lately addressed you.

In my "Treatise on the Combustion of Coal," I have dwelt on the loss occasioned by the escape of a large quantity of the carbon of the coals, in the form of a gas, called *carbonic oxide*. I have shown that this gas, which is a combustible, is formed from the carbonic *acid*, which is an incombustible: that it therefore requires its due portion of atmospheric oxygen; and that this portion is precisely the same as was originally required for the carbon, in the carbonic acid previously produced in the furnace. I showed that, because this was an *invisible* gas, we were in the habit, in practice, of neglecting its effect, and providing it with the due quantity of air; and that because its imperfect combustion was not *visible* in the form of *black* smoke, its very existence was even denied by many practical men. In the following communication, however, this question is set at rest; as we find this very neglected gas, carbonic *oxide*, actually collected, and made the instrument of very extensive purposes, and producing intense heat. Here is no theory, but the best practice, namely, that on a large scale. The letter is as follows:—

"New York, November 25, 1841.

"Sir,—I have not the honour of being personally acquainted with you, yet I feel myself entitled to the liberty which I take in addressing you, were it only to express to you my sense of obligation which the perusal of your most valuable book, "On the Combustion of Coal," has laid me under.

"My object in writing to you now is, to draw your attention to the fact, that the result of your admirable and thorough inquiry into the theory of combustion has, for some time past, been in most successful operation on the continent of Europe; and that, in fact, its application to practice, in the manufacture of iron, has already been productive of an immense economy of fuel, and most valuable improvements in that important branch of industry.

"Mr. Faber, director of the royal mines at Wasseralfingen, in the kingdom of Wirtemberg, has for some years been engaged in a series of experiments upon the combustion of the large quantities of *carbonic oxide* gas, which is generated in blast-furnaces, and which generally escapes unconsumed out of the mouth of the furnace, where it may be seen burning with a blue flame. He has now succeeded in *collecting* this gas, and *conveying* it in a pure and uninflamed state to other furnaces or ovens requiring to be heated; and there, by a proper admixture of atmospheric air, its complete combustion, (or conversion into carbonic *acid* gas,) is effected, and consequently an intense temperature is produced in the furnace.

"The *mode of mixing* the gas, and the whole process of combustion, as practised by Mr. Faber in his furnaces, is in beautiful harmony with the theory which you have so conclusively established; and it is truly interesting to observe the exact coincidence of your scientific investigation with the actual results of a long course of practical experiments made on a large scale by M. de Faher.

"According to Mr. Faber's method, the air is forced into the furnace, which is to be heated by the carbonic oxide gas, through a *series of blow-pipes*, after having been previously heated in the furnace itself to a high temperature. To afford the air and gas sufficient time for an internal mixture and incorporation, before they are burned in the main chamber of the furnace, the fire-bridge is made very long, thus complying with all the conditions necessary to a complete combustion; which is, in fact, effected in the main chamber of the furnace. This being the case, there is of course *no smoke*, and consequently ***no chimneys are required*** in the furnaces employed by Mr. Faber.

"In furnaces of that construction, Mr. Faber employs the otherwise lost carbonic *oxide* gas, for the purposes of refining, puddling, reheating, and forging the iron; and to various other operations, requiring a high temperature, with the most perfect success: so that nearly all the large iron

establishments in Germany, and many in France and Belgium, are adopting the invention of Mr. Faber. This invention has been secured by patents in all those countries; also in England. It has also been applied to steam-boilers, for the purpose of burning the gases that are generated in boiler furnaces, and escape unconsumed with smoke out of the chimney.

"I am very desirous of knowing how your patent furnace is operating in practice. I should take it as a great favour if you would communicate to me some information on the subject, as I take the liveliest interest in its success.

"I remain, Sir, with the highest respect,
"Your obedient servant,
"C. Detmold, C. E."

"To C. W. Williams, Esq.,
"Liverpool."

The facts communicated in the foregoing letter are of the last importance to the entire manufacturing interests in this country, and I feel much indebted to Mr. Detmold for his valuable statement. It will, I trust, satisfy (or silence) those who have so pertinaciously denied the statements made by me, (and for which I adduced the highest chemical authority,) as to the existence of this gas, (carbonic *oxide*,) and the necessity of providing the due supply of atmospheric air for its combustion; and this *behind* the bridge, in order to prevent its escape unconsumed. For insisting on the value of a supply of air, in this way, I have been charged with the "grossest ignorance;" and the necessary effect of the air so supplied is alleged to be, the destruction of the boilers, by the *cooling* effect it produces. Strange to say, that such absurdities are actually believed and acted on, at a time when not only chemistry, but common sense and practical observation, should have rejected the idea, as unworthy a moment's consideration.

It is asserted, and the alleged fact published, that, because I do not, by some regulating and closing valve, absolutely *prevent* the admission of any air behind the bridge, where the carburetted hydrogen gases are all evolved, and the fire is clear and a bright red, and the solid fuel on the bars highly ignited, such air has the effect of *cooling* and *contracting* the plates of boilers; and that this contraction will go on to such an extent, that the rivets will be dragged successively, (by this curious contracting and expanding process,) in opposite directions, until they become loosened in the rivet-holes, and the boiler becomes leaky.

Now, Sir, the whole of this ingenious crudity is utterly at variance with fact; for at the very moment when the fire is in this clear red hot state, and the fuel on the bars highly ignited; and when it is alleged there is *no gas to be consumed, or to require a supply of air*, at that very moment the largest quantity of carbonic oxide gas is generated, and a large supply of air required for its combustion; thus *increasing* the heat, rather than producing a *cold* effect, and preventing this same gas escaping by the chimney unconsumed, or of being consumed at the top, as we frequently see from the tops of our steam-packet funnels.

That such silly and unfounded theories as above alluded to should be uttered or credited in our day is very discouraging to those who wish, by the application of science to practice, to enlighten our practical mechanics, and improve our systems.

The subject, thus strikingly brought forward by Mr. Faber's letter, is so important, and its connexion with our every-day practice, in the management of ordinary boiler furnaces, so direct, that I propose returning to it in your next number.

I am, &c.,
C. W. Williams.

Liverpool, December 28, 1841.

THE MODERN MECHANICAL MOLOCH.

The railway system has been productive of another appalling accident—the most deplorable, by far, which has yet stained its chequered annals. Eight persons in an instant dashed to atoms, and twice as many grievously wounded! How many more such instances of horrid carnage must we wait for, before the legislature shall think it time to interfere for the protection of outraged humanity? It is idle to talk any longer of the dependence to be placed on the spontaneous exertions of the Railway Companies—of their interest in safety of conveyance being identical with that of the public—and so forth. The country has had several years of this dependence, and what has been the result? One long, continuous,

endless train of disastrous accidents, nine-tenths of which might have been averted by the exercise of due care and prudence on the part of these very companies, who would still have us place all our trust in them! Deodand after deodand has been imposed by honest and indignant juries—deodands surpassing in amount any previously known to our criminal history—denunciation on denunciation has been fulminated from the press—and yet the companies have adhered as doggedly to their life-and-limb-destroying practices as ever. Not one improvement, of any material consequence, have they ever originated or adopted, in obedience to the public voice. Nay, so dead to shame are they, that, when heaped with obloquy, to a height which would have crushed any ordinary body of public-disregarding monopolists, they had actually the assurance to protest, by their representatives, at a late Public Conference, that, so far as depended on them, (the Directors, Managers, and other chief executive officers,) there was no room for improvement whatever!

Be it ever remembered—it is for the honour of the railway system itself that it should be remembered—that the greater number of all the accidents in question are traceable to circumstances which have no *necessary* connexion with the system. The same mechanical ingenuity and skill which have given us, in the modern railway, a swifter means of transit than the world ever before possessed, could also, if allowed fair play, have rendered it as safe as it is swift; but owing to something or other faulty in the construction of these companies that fair play they have not had—they have been superciliously repulsed, where they ought to have experienced every possible encouragement—rudely denied the opportunity of perfecting that which they originated. Scarcely a single accident can be pointed out, which would not, by the adoption of some plan proffered to, but slighted or rejected by, the companies, have been most certainly prevented.* And for these reasons it is, that we invoke the paternal interference of the legislature, and deprecate any further exclusive reliance on the companies.

The case which has now immediately called forth these observations furnishes ample confirmation of their truth. Early on the morning of the day preceding Christmas, one of the trains on the Great Western Railway, consisting of "an engine and tender, two (third class) passenger trucks *placed next to the tender*, a truck for passenger's luggage, and 16 luggage waggons" (*Evidence of Hudson, the guard*) "ran into some loose earth which had slipped from the side of the (Sonning) cutting on to the rails" (*Evidence of Reynolds, the driver.*) "The carriages by the sudden stoppage came upon each other with such a concussion, that the passengers were thrown out in all directions among the carriages."—(*Hudson.*) Eight were killed and 17 more or less wounded. The luggage trucks which were in the rear do not appear to have been at all damaged. Now the danger of this practice of placing the passenger trucks next to the tender and carriages,—a practice common to other companies as well as the Great Western—had been times without number pressed on the attention of the railway companies, and was in fact a subject of universal complaint. Several accidents had occurred from it, and one of a very fatal nature not long ago on the Brighton. Indeed, just before the starting of the very luggage train which met with the disastrous accident now in question, the propriety of placing the passengers next the engine and tender appears to have been a matter fully discussed between the three principal officers of the Great Western Railway, the Engineer, Secretary, and Superintendant. "The passenger truck," says Mr. Brunel, "was put *in the middle of the train*," (a point, however, in which Mr. Brunel is flatly contradicted by Hudson, the guard, and is most assuredly in error,) "by my order, *merely as a concession to opinion which I knew had been frequently expressed.* On the evening in question I discussed the matter with the Superintendant, and Mr. Saunders, at Paddington. I thought it would have been better not to have sent down any luggage train that night; but there were so many applications for places, that *we thought it better to place the passenger truck in the middle, lest it should be considered a mere act of obstinacy if we adhered to the former practice.*" How it came to pass after the decision thus come to, or pretended to be come to, that the passenger trucks (for there were two of them,)

were not placed in the middle of the train, but in their old place of imminent danger next to the engine and tender, does not appear; but when we consider that Mr. Brunel tells us at the same time, that his own "decided opinion is, that near the engine is preferable to behind the goods trucks," and that Mr. Saunders, the Secretary, adds, that "if the control remained in his hands, he should undoubtedly,"—notwithstanding all that has occurred—the public opinion notwithstanding—and the tragical event by which the soundness of that opinion has been just illustrated notwithstanding—"*adhere to the practice of placing the passengers' trucks in luggage trains in front*" (!!?)—it may not be difficult to guess pretty correctly where the blame lies. He is a dull officer who cannot distinguish between an order given in earnestness and sincerity, and one given only to be disobeyed. Let the understanding, however, of the parties concerned in the present case, be as it may, these facts are certain: *first*, that the accident from which such fatal consequences have arisen, was caused by adherence to a practice long denounced as imminently dangerous by all the rest of the world, save certain of the railway authorities themselves (the value of whose reasons it is under the circumstances needless to discuss); *secondly*, that had the unfortunate passengers been only placed where the goods were, they might all at this moment have been alive and well; and, *thirdly*, that there are parties of note and influence among railway managers, who, if they could still have all their own way ("if the control remained in their hands") would listen neither to the exhortations of wisdom and humanity, nor even to the bitterer lessons of experience.

But this is not all. There are authorities of great eminence and weight in the scientific world, who consider that it is by no means sufficient for the safety of railway passengers, that they should be placed at a distance from the engine and tender, with luggage or other carriages between, and who have strenuously urged that all carriages conveying passengers, should be preceded by a separate carriage, "carrying a buffer of sufficient power to save the whole train," and that every carriage, whether carrying passengers or goods, should be provided with separate buffers, to assist in diminishing the shock from concussions. Sir George Cayley, Bart., has furnished the plan of an air buffer of the former description, which he calculates would have a power of retardation, without the least risk of breakage or upsetting, of 39 tons, and which might have its power increased to any requisite extent. (*Essay on the Prevention of Railway Accidents.*) He supposes the case of two heavy trains, provided with such buffers, meeting each other on the same line of rails at full speed, and shows that "if the elasticity of the buffers be supposed perfect, each train would rebound with the same velocity it advanced." Dr. Mallet, of Dublin, following in the same track, has invented a hydro-pneumatic buffing apparatus, of great ingenuity and efficiency, in describing which, he lays it down as an indisputable principle, that until railway passengers sit in carriages either protected by a general buffing apparatus placed in advance, or each of them so constructed, that in the event of a collision "they shall not only ease the blow to the utmost, but be competent to bear the residual shock, railway travelling *must be always liable to frightful accidents.*" (*Mech. Mag.*, No. 956.) An experiment was made with a buffer of this kind on the Dublin and Kingston railway, which consisted "in bringing the carriage upon one of the lines, and causing ten or twelve of the railway porters to run it as fast as they could, full tilt against one of the stone walls of the station-house, *from which it rebounded like a piece of Indian-rubber.*" Sir Frederick Smith, the late able superintendent of railways, has also, in more than one of his reports to the Board of Trade, strongly recommended that every railway carriage, of whatever description, should be provided with buffers.

Now we do not ask why the Great Western Railway Company have not adopted either Sir George Cayley's plan or Mr. Mallett's, since it might possibly be pleaded in extenuation that no great time had yet elapsed since they were first promulgated; but we think we are in good reason entitled to ask whether all or any of the carriages in the train which met with the late unfortunate accident, were provided *with buffers of any sort?* Whether *any means whatever* were provided for enabling the carriages to sustain, without damage, any collision which might happen to them, in

the course of their hundred and eighteen miles of transit under the cloud of night? And what is the practice, in general, of the company, on this head? Are any of their other trains suitably provided with buffers? Or if not, what experiments or trials have they made, with a view to ascertain the best plan of so protecting them? All these are questions which ought to have been put at the inquest on the bodies of the persons killed, but *were not*; and it is the more necessary, therefore, that they should be put now, and distinct answers obtained. If we might give full credence to an assertion made by Mr. Saunders, that "*every* precaution that could be *thought* of to ensure punctuality and *safety*, has been *adopted* by the directors," there would be no need to push enquiry any farther; but we have just mentioned two very necessary and excellent "safety" plans which have been "thought of," but neither of which has, to a certainty, been "adopted;" and we doubt, exceedingly, whether it is in the power of the Great Western Directors to show that any better plan, or indeed any plan whatever, has been "adopted" by them, having the same essential object in view —namely, the protection of passengers from destruction or injury in cases of collision. We believe that it is quite within the limits of mechanical practicability, to render all such collisions harmless; and we can never hold any company free from serious blame, which does not use its best exertions to do so.

THE TERM "MEDIUM OF SPACE."

SIR,—So many disputes arise from a want of agreement in the meaning of terms, that I am induced to make the following observations respecting the term, "Medium of space," in Mr. Pasley's last communication. *Practician* may be a better term than *practitioner*, and "*Medium of space*" may be a better term than "*firmamental fluid*," but in both cases, do not both terms imply the same things? Is not "the medium of space" "the *freezing principle*," so long inquired about by philosophers? Would it be possible for motion to occur within it, if it did not itself undergo a chemical change? And is there in nature any thing capable of producing this physical change, but the friction attendant on life? As every grain of sand tends to check the advance of the ocean, so every movement of animal life tends to promote the circulation of the universe. Heat and cold are, as every one knows, sensations; but they are sensations caused by different dispositions of matter, as we may see by their effects on substances which are devoid of sensation. The sensation of heat is caused by the motion of matter in the *form* of heat; and the sensation of *cold*, by the presence of more of the firmamental fluid, or "medium of space," than the vital energy can convert into heat with sufficient rapidity.

If animal life were extinct, the motion of the universe would cease, although the time for its entire cessation might be of long duration. Of course I mean mechanically—that is, without reference to the power of the Almighty. Surely *all* sensations are the effects of the action of matter, or the *recollection* of the effects of such action. It is useless in this world to pretend to free ourselves from matter; matter must be the stepping-stone to another sphere, whatever other assistance we may require. The immaterial I presume not to discuss. A white leaf and a black dye might express all the wonders of creation. The firmamental fluid, or "medium of space," with an atom, *can* account for them. Under this view of things Alfonzo "the Wise" would never have said, "If he had been consulted in the creation, he would have made the universe more simply."

Your obedient Servant,

E. A. M.

Dec. 22, 1842.

STEAM NAVIGATION OF THE ATLANTIC—THE RIVAL BRISTOL AND LIVERPOOL LINES.

[We copy the following historical retrospect from our excellent provincial contemporary, the *Bristol Magazine*. Although not free from the exaggeration of colouring common to all local effusions having for their object the exaltation of local achievements and interests, we consider it to be true in the main, and eminently deserving, on public grounds, of the attention of the public at large. To say how cordially we assent to all that is here said, in praise of the *Great Western* and her performances, would be only to repeat what we have before more than once said on the subject; but we may be ex-

cused, perhaps, for reminding our contemporary, who claims for Bristol exclusively the entire merit of all this vessel has accomplished, that *her machinery*, to which, more than any thing else, her pre-eminent success has been owing, were of *London make*, and, (at first, at least, if not to this day,) worked by *London engineers*.—ED. *M. M.*]

It will be fresh in the remembrance of many persons, that, previous to the starting of the *Great Western* on her first Trans-Atlantic trip, the idea of establishing steam communication regularly with the United States was held, very generally, to be a pure chimera; and a high scientific authority was understood to have stated in his lectures, that it never could be accomplished. During the time the *Great Western* was on the stocks, however, other parties, seeing the grand scale on which the attempt was to be made in Bristol, resolved to endeavour to eclipse it, by enlarging on the same plan in London. Thus the British and American Steam Navigation Company was formed; and, in order to deprive Bristol of the honour of being first in the field, they chartered one of the largest and most powerful steamers then in the world—the *Sirius*, of 700 tons, and 320-horse-power—a proportion, be it observed, which by ordinary calculation *ought* to have given her greater speed than the *Great Western*. This vessel was ostensibly put on to pre-occupy the ground for the *British Queen*, which was then building, and being sent round to Cork at the latter end of March, 1837, under the command of Lieut. Roberts, R.N., who was subsequently lost in the *President*,—she sailed thence for New York on the 4th of April, with a fine N.E. wind, and three days afterwards the *Great Western* started from Bristol for the same port, with a gale of wind "in her teeth," and with 240 miles further to run than the *Sirius*. Under these circumstances, it was not within the bounds of probability, in the absence of accident to either, that the *Great Western* could overtake the *Sirius*, and accordingly the latter did reach New York first, having arrived on the evening of the 22nd of April at New York, after a passage of *eighteen days from Cork*, and early the following morning the *Great Western* was reported, having arrived *from Bristol in fifteen and a half days*. Thus establishing her superiority so triumphantly, that the interest of the enterprize was speedily transferred to her; and it was evident to all, that no kind of comparison could be made between the suitableness of the two vessels for traversing the Atlantic. The voyage of the *Sirius* proved little or nothing; the distance between Ireland and New York had often been run by sailing vessels in less time than eighteen days, though perhaps scarcely ever on the outward passage. But, outward or homeward, no one ever heard of the distance between Bristol and New York being accomplished in fifteen days; and it was the *Great Western* alone, therefore, which even then established the entire success of the attempt.

Several competitors, entered the field, and two other steam-boats besides the *Sirius* started about the time of the *Great Western*, and managed to get across the Atlantic; but these either never repeated the attempt, or they gradually dropped off, while the *Great Western* still pursued "the even tenor of her way." Public attention, however, was in some measure diverted from the *Great Western* by the gigantic preparations of the British and American Steam Navigation Company, who appeared determined that her glories should be speedily eclipsed, or lost in the splendour of their own achievements. What Bristol had accomplished with such apparent facility, must be still more easy to London and Liverpool; and shortly afterwards the *British Queen*, and then the *Great Liverpool*, and the *President*, successively entered the lists, and disputed with her the supremacy of the Atlantic Ocean. In the mean time the attention of the government was attracted to the importance of establishing a mail communication by steam with the British Possessions in America; and it is understood that the *Great Western Steam Ship Company* offered for the contract, on terms very favourable to the Post Office Establishment. Whether it arose from the difficulty of impressing the government with the idea that any thing excellent, in the way of enterprise, could originate in Bristol or not, we cannot say, but without, we believe, any intermediate communication with the proprietary of the *Great Western*, some additional conditions were tagged to the proposals, which probably if they had been made aware of them, they would cheerfully have complied with, and the contract for the transmission of the British Mails, by way of Halifax and Boston, was given to a Liverpool house—who were *to build* vessels we know not how much superior to the *Great Western*—at an expense to the country of *fifteen thousand* a-year more than the Great Western Company required, and which has since been increased to thirty-five thousand a-year.

While these vessels are in preparation the competition on the Atlantic takes place, and the proprietors of the proud steam-ships, who scarcely thought it a compliment to hear them spoken of as rivals of the *Great Western*, were not long in discovering that to build a steam-vessel that should successfully contend with her for the palm of excellence, was not quite so easy as they had imagined.

The government contractors proceeded to carry out the terms of their agreement, and four large steamers, on the most approved models, were constructed for the purpose, with less bulk and greater power than the *Great Western*, from which it was expected that an increase of velocity and more punctuality would be secured; and against these vessels, which run to Halifax and Boston, with *eighty thousand a-year of the public money* to back them, the *Great Western* has had to compete single-handed for the last two seasons.

We do not wish to institute any invidious comparisons; but something is due to justice, and there are a few statistical facts connected with this subject which might form the ground of a curious enquiry. In the first place, the *Great Western* proprietary might reasonably have expected, without the slightest approach to anything like presumption, that our own government would feel some interest in the success of an undertaking which appeared to have attracted the sympathies of the whole civilized world. When it was understood that the *Great Western* had finally departed for America the press of Europe was occupied with the subject, and as the time approached for her return, nations stood on tip-toe awaiting the event. We need not dwell on the enthusiasm which seemed to pervade society at large on her successful return: it was like a national congratulation,—the winning of another battle of Waterloo, without its horrors. Again and again the experiment was repeated, and always with the same success; and when in the wide world she had not a competitor, and the Government saw the expediency of dispatching our North American mails by steam, what was more to be expected than that it would rejoice to throw in its powerful aid in support of an undertaking which had already earned "golden opinions from all sorts of people?" On the contrary, however, not only the *Great Western* Company obtained no preference, but they were not even allowed to carry the mails at *less* than any other Company could undertake them; and instead of receiving encouragement from the Government, a premium of 15,000*l.* a year was absolutely given for the building of vessels to oppose them, and as this, it appears, was not enough, a sop of 20,000*l.* a year has since been added to keep up the spirit of the thing.

We are well aware that the wisdom of Government is easily arraigned by taking a one-sided view only of a question; and it will naturally be inferred that its objects were such as could not be carried out by the *Great Western* proprietary, and that Liverpool was the most suitable port for the station of the vessels. We come, then, to inquire what the exigencies of the Post-Office service particularly demand,—evidently *speed* and *punctuality*; and, as far as these are concerned, it will not be difficult to show that, so far from gaining by making Liverpool the American mail station, it is a positive disadvantage to the country, and that in respect to the speed of transmission, the Government pays its thirty-five thousand a year *extra* for less than nothing.

We have not space, nor is it indeed necessary, to go into a regular analysis of the voyages of the *Great Western*, and the Liverpool and Halifax line of steamers. It is well known, that for speed the former has never, on any occasion, been surpassed on the Atlantic; while for punctuality, no kind of comparison can be made between the *Great Western* and any of her competitors. What, for instance, is more common than to see in the London papers such paragraphs as the following:—"No account of the *Caledonia* yet, now three days over-due." "Some anxiety is felt respecting the *Colombia*, which ought to have arrived on Tuesday last," "We are still unable to give our readers any account of the arrival of the *Arcadia.*" And we are sure the vigilant gentlemen connected with the London press in this city will bear us out in saying that nothing is more *un*common than their being kept waiting at Pill *six hours* for the arrival of the *Great Western.* And as to the general question of the relative merits of the *Great Wester*, and Bristol, *versus* Liverpool and the Halifax steamers, the last voyage will afford a very good criterion for estimating the whole.

The *Britannia* left Liverpool for Halifax and Boston on the 21st of October; and the *Great Western, two days afterwards,* left Bristol for New York, having to pass Halifax and Boston; from the latter of which there is railway communication with New York, notwithstanding which she delivered her letters in New York *nine hours before the arrival of the mail per Britannia.*

On the return voyage, the *Britannia* got home in fourteen days, (exclusive of delay at Halifax,) to Liverpool; and the *Great Western,* with a day's steaming farther to run, in thirteen and a quarter, to Bristol, the latter delivering her news in London within thirty hours of the time of passing Cape Clear; a period in which, without fear of falling into the error of Dr. Lardner, we may safely assert it never was, nor ever *can* be done by way of Liverpool. Nothing, therefore, can be more certain than that at the present time the New York letters, posted per the *Great Western,* are delivered in Liverpool sooner, *via* Bristol, than they could be by their own mails direct, if sailing at the same time; and it is equally easy of demonstration, that even

if the *Great Western* had no advantage over them in point of speed, the same end would be secured in a general way, were the Gloucester and Bristol railway completed.

The distance between the Bristol and the Liverpool courses, in favour of the former, calculated to a point of junction off Cape Clear, we will only estimate at forty miles, though we find that, when it is a question of the distance run, they call it seventy in Liverpool; and we will allow this forty to be run, on an average, in four hours. Now we know it for a fact, from the best authority, that there is occasionally only *nine feet*, at low water, in the Victoria Channel, at Liverpool, and that a steam-vessel, drawing *twelve and a half feet*, may be detained *five* hours outside. All the Halifax line have been detained—the *Britannia* was detained three and a half hours her very first voyage—and allowing, on an average, that this disadvantage will make the difference six hours in favour of Bristol, it is not too much to say, that when the Gloucester and Bristol railway is opened, we shall be enabled to deliver the American letters in Liverpool, *via* Bristol, sooner than they could get them by sea direct.

PRACTICE AND PRACTICIANS, *v.* MATHEMATICS AND MATHEMATICIANS.—S. Y. IN REPLY TO MR. CHEVERTON.

Sir,—If what somebody said of me "many, very many years ago," had been as unimportant to Mr. Cheverton as it is irrelevant to the present discussion, he would not have quoted it. It is with my *remarks* he has to contend; what somebody said I should be, or what I am, it is impertinent on his part to observe upon. But if Mr. C. wrote the paper from which he quotes, (for I have entirely forgotten both it and the occasion of it,) he may console himself by imagining that, whatever I may be, I *might* have been something worse, if the "censure" he has treasured in his memory for the aforesaid "very many years" had not "alighted" on my devoted head.

If Mr. Cheverton's paper, in No. 956, had explained and enforced the necessity of caution in the application of mathematical theories to practical purposes, I should not have found fault with it; but its tendency appears to me to be widely different, and also to be utterly pernicious; and I read it with feelings of great indignation. I am old enough to remember the time when practical men regarded theorists with a feeling nearly allied to contempt and dislike; I have seen this feeling gradually give place to a better one, arising from more enlightened views; and I have seen with delight the benefits derived by both classes—but more particularly my own—from the greater intimacy and better understanding which has grown up between them. While this is progressing, in a manner which must gratify all lovers of knowledge, up starts Mr. Cheverton, and does his best to persuade the less educated class that it is the superior of the two; that the science which is more general in its application, and more extensively useful than any other, is a noxious science; that it produces something worse than "baneful effects;" that it is a science "feeble" in means, but "arrogant of pretension," &c. &c.; and I did his paper the undeserved honour of getting angry with it.

I did not expect that my remarks, which appeared in No. 958, would be particularly pleasing to Mr. Cheverton; but he was not considered when they were written. I attacked his statements and his arguments; and, by way of defence, he, in No. 959, attacked *me* and my *manner*; neither, it seems, is to his taste, which is a misfortune about which your readers will probably not feel any great concern, and which I have not leisure to deplore. As to whether I have shown an inclination to "distort and misrepresent" Mr. Cheverton's statements, your readers can judge for themselves, if they choose to take the trouble.

Almost all the rest of Mr. C.'s paper, in No. 959, is personal, and I shall take no further notice of it; not because I wish to show any contempt for such remarks, which are of a nature that I believe Mr. C. does not often indulge in, but because I think your readers will not derive much benefit from such discussions.

Yours, &c. &c.

S. Y. (an Engineer.)

December 27, 1841.

P.S.—Perhaps Mr. Cheverton will perceive that, after the objection I raised has been obviated by the alteration of Professor Moseley's machine, it will not be exactly the same machine that he eulogized so highly in No. 956; and possibly he will enlighten your readers by describing *one* of the "many expedients" he mentions at page 510.

AMERICAN TIMBER.

[From a paper on the Building Materials of the United States of North America. By David Stevenson, C. E., Edinburgh. From the Transactions of the Royal Scottish Society of Arts. Session 1841.]

The forests, to the British eye, are perhaps the most interesting features in the United States, and to them the Americans are indebted for the greater part of the materials of which their public works are constructed.

These forests are understood to have originally extended, with little exception, from the sea-coast to the confines of the extensive prairies of the western states; but the effects of cultivation can now be traced as far as the foot of the Alleghany Mountains, the greater part of the land between them and the ocean having been cleared and brought into cultivation. It is much to be regretted that the early settlers, in clearing this country, were not directed by a systematic plan of operations, so as to have left some relics of the natural produce of the soil, which would have sheltered the fields and enlivened the face of the country, while at the same time they might, by cultivation, have been made to serve the more important object of promoting the growth of timber. Large tracts of country, however, which were formerly thickly covered with the finest timber, are now almost without a single shrub, every thing having fallen before the woodman's axe; and in this indiscriminate massacre there can be no doubt that many millions of noble trees have been left to rot, or, what is scarcely to be less regretted, have been consumed as fire-wood. This work of general destruction is still going forward in the western states, in which cultivation is gradually extending; and the formation of some laws regulating the clearing of land, and enforcing an obligation on every settler to save a quantity of timber, which might perhaps be made to bear a certain proportion to every acre of land which is cleared, is a subject which I should conceive to be not unworthy of the attention of the American Government, and one which is intimately connected with the future prosperity of the country. But should population and cultivation continue to increase in the same ratio, and the clearing of land be conducted in the same indiscriminate manner as hitherto, another hundred years may see the United States a *treeless* country. The same remarks apply, in some measure, to our own provinces of Upper and Lower Canada, in many parts of which the clearing of the land has shorn the country of its foliage, and nothing now remains but blackened and weather-beaten trunks.

The progress of population and agriculture, however, has not as yet been able entirely to change the natural appearance of the country. Many large forests and much valuable timber still remain both in Canada and in the United States; the Alleghany Mountains, as well as other large tracts of country towards the north and west, which are yet uninhabited, being still covered with dense and unexplored forests.

The timber trade of the United States and of Canada, from the quantity of wood which is required for home consumption and exportation, is a source of employment and emolument to a great mass of the population. It is carried on to a greater or less extent on all American rivers, but the Mississippi and the St. Lawrence are more especially famous for it. The chief raftsmen, under whose direction the timber expeditions on these rivers are conducted, are generally persons of great intelligence, and often of considerable wealth. Sometimes these men, for the purpose of obtaining wood, purchase a piece of land, which they sell after it has been cleared; but more generally they purchase only the timber from the proprietors of the land on which it grows. The chief raftsman and his detachment of workmen repair to the forest about the month of November, and are occupied during the whole of the winter months in felling trees, dressing them into logs, and dragging them with teams of oxen on the hardened snow, with which the country is then covered, to the nearest stream. They live during this period in temporary wooden huts. About the middle of May, when the ice leaves the rivers, the logs of timber that have been prepared and hauled down during winter are lanched into the stream, and being formed into rafts, are floated to their destination. The rafts are furnished with masts and sails, and are steered by means of long oars, which project in front, as well as behind them: wooden houses are built on them for the accommodation of the crews and their families. I have several times, in the course of the trips which I made on the St. Lawrence, counted upwards of thirty men working the steering oars of the large rafts on that river, from which some idea may be formed of the number of their inhabitants. Those rafts are brought down the American rivers from distances varying from one hundred to twelve hundred miles; and six months are often occupied in making the passage. When it is at all possible, they moor them during the night in the still water at the edge of the river; but when this cannot be done, they continue their perilous voyage in the dark, exhibiting lights at each corner of the raft to warn vessels of their approach to them. The St. Lawrence rafts vary from 40,000 to 300,000 square feet, or from about one to no less than seven acres in surface, and some of them contain as much as 5000*l.* worth of timber. If not managed with great skill, these unwieldy specimens of naval architecture are apt to go to pieces in descending the rapids, and it not unfrequently happens that the labour of one, and sometimes two seasons is in this way lost in a moment. An old and experienced raftsman, with whom I had some conversa-

tion on board of one of the St. Lawrence steamers, informed me that he, on one occasion, lost 2,500*l.* by one raft, which grounded in descending a rapid and broke up. He said the safest size for a raft was from 40,000 to 50,000 square feet, or about one acre, and that five men were required to work a raft of that size.

The species of forest trees indigenous to different countries is an interesting subject connected with vegetable physiology. There are said to be about thirty forest trees indigenous to Great Britain, which attain the height of thirty feet; and in France there are about the same number. But according to the best authorities, there are no less than 140 species, which attain a similar height, indigenous to the United States.

To notice each of these numerous species, whose timber is employed by the Americans in the arts, even if I were able to do so, would greatly exceed the limits to which I am restricted by the nature of the present communication; and I shall therefore only make a few remarks regarding those timbers which are most highly prized and most extensively used in the ship carpentry and public works of the country.

The first which I shall notice is the Live Ock (*Quercus virens,*) so named because it is an evergreen, its leaves lasting during several years, and being partially renewed every spring. It grows only in the southern states, and is one of the most valuable of the American timbers. The duty imposed by our government on wood from the United States prevents its importation into Britain, and as live oak grows only in the United States, and is not found in Canada, it consequently never reaches this country as an article of commerce; the whole produce being consumed by the Americans themselves in ship-building. Its specific gravity is equal to, and in some cases greater than, that of water, and it is used along with white oak and cedar for the principal timbers of vessels. The climate, according to an American authority,* becomes mild enough for its growth near Norfolk, in Virginia, though at that place it is less multiplied and less vigorous than in more southerly latitudes. From Norfolk it spreads along the coast for a distance of 1,500 or 1,800 miles, extending beyond the mouths of the Mississippi. The sea air seems essential to its existence, for it is rarely found in the forests upon the main-land, and never more than fifteen or twenty miles from the shore. It is most abundant, most fully developed, and of the best quality, about the bays and creeks, and on the numerous fertile islands which lie scattered for several hundred miles along the coast. The live oak is generally forty or fifty feet in height, and from one to two feet in diameter; but it is sometimes much larger, and its trunk is often undivided for eighteen or twenty feet. There can be little doubt, from its great density and durability, that this is one of the finest species of oak that exists, surpassing even that for which Great Britain is so famous. Its cultivation has been tried in this country, without success; but could it be imported, it would be found admirably suited for the construction of lock-gates, and other engineering works, for which hard and durable timber is required, and for which English or African oak is generally used.

The White Oak (*Quercus alba,*) is the species of which so much is imported into this country. It is known by the name of "American oak," but it is a very different and much inferior wood to the live oak of the United States which I have just described. It is also much more widely distributed, and occurs in much greater quantity, than the live oak. It is very common throughout the northern states, and in Canada, from whence it is exported to this country. It attains an elevation of seventy or eighty feet, with a diameter of six or seven feet. It is known by the whiteness of its bark, from which it derives its name, and from a few of its leaves remaining on the branches in a withered state throughout the winter. The wood is of a reddish colour, and in that respect is very similar to English oak. But it is generally acknowledged to be greatly inferior to it in strength and durability. It is very straight in the fibre, however, and can be got in pieces of great length and considerable scantling—properties which, for certain purposes, make it preferable to the British oak. It is much used in ship-building, and also for the transverse sleepers of railways. There are many other oaks in the United States, but the two I have mentioned are those most in use.

The pines are perhaps the next woods in importance to the oaks. The species of those are also very numerous, and I shall only mention one or two of the most important of them.

The White, or Weymouth Pine, (*Pinus strobus,*) is widely distributed both in the United States and in Canada, and is exported to Britain in great quantities from the latter country. It is the tallest tree of the American forest, having been known, according to Michaux, to attain the height of 180 feet. The wood has not much strength, but it is free from knots, and is easily wrought. It is very extensively employed in the erection

* The Sylva Americana, by J. D. Browne. Boston, 1832.

of bridges, particularly *frame* and *lattice* bridges, a construction peculiar to the United States, and very generally adopted in that country, which I have described in detail elsewhere.* For this purpose it is well fitted, on account of its lightness and rigidity, and also because it is found to be less apt to *warp* or *cast*, on exposure to the atmosphere, than most other timbers of the country. It is much used for the interior fittings of houses, and for the masts and spars of vessels.

The Yellow Pine, (*Pinus mitis* or *variabilis*,) occurs only in the southern and middle states, and is not found in Canada, and therefore does not reach this country, the wood known by that name in Britain being the *Pinus resinosa*. It attains the height of 50 or 60 feet, with a diameter of 2 or 3 feet, and is the timber which the Americans employ in greatest quantity for the masts, yards, booms, and bowsprits of their vessels. A large quantity of it is annually consumed for this purpose in the building-yards of New York, Philadelphia, and Baltimore.

The Red Pine (*Pinus resinosa*) is the only other of the pine species that is much used, It occurs in great plenty in the northern and middle states, and in Canada, from whence it is exported in great quantity to this country, and it is known to us by the name of "American yellow pine." It attains the height of 70 or 80 feet, with a diameter of two feet, and is remarkable for the uniform size of its trunk for two-thirds of its height. Its name is derived from the redness of its bark. The wood, owing to the resinous matter it contains, is heavy; and is highly esteemed for naval architecture, more especially for decks of vessels, both in this country and in America.

The Locust (*Robinia pseud-acacia*), from the beauty of its foliage and the excellent qualities of its timber, is justly held in great esteem in America. It abounds in the middle states, and in some situations attains the height of seventy feet, with a diameter of four feet. The wood of the locust tree is of a greenish-yellow colour, marked with brown veins, not unlike the laburnum of this country. It is a close-grained, hard, and compact wood, and is of great strength. It is used, along with live oak and cedar, for the upper timbers of vessels, and is almost invariably used for treenails, to which it is well adapted. It is also employed in some parts of the country as transverse sleepers for railways. Its growth being chiefly confined to the United States, it is not imported into Britain. It is one of the very few trees that are planted by the Americans, and may be seen forming hedge-rows in the highly cultivated parts of Pennsylvania.

The Red Cedar (*Juniperus Virginiana*) is another valuable wood, the growth of which is confined to the United States. In situations where the soil is favourable, it grows to the height of 40 or 50 feet, with a diameter of 12 or 13 inches. This wood is of a bright red colour; it is odorous, compact, fine-grained, and very light, and is used, as already stated, in ship-building, along with live oak and locust, to compensate for their weight. It is considered one of the most durable woods of the United States, and being less affected by heat or moisture than almost any other, it is much employed for railway sleepers. I remember, in travelling on some of the railways, to have been most pleasantly regaled for miles together, with the aroma of the newly laid sleepers of this wood. It is now, however, becoming too scarce and valuable to be used for this purpose.

The White Cedar (*Cupressus thyoides*), and the Arbor Vitæ (*Thuja occidentalis*) are employed for sleepers and other purposes to which the red cedar is applied, but the latter is preferred when it can be obtained.

The only other tree which I shall notice is the Sugar Maple (*Acer sacharinum*), which occurs in great abundance in Canada and the northern states. It attains the height of 50 or 60 feet, and is from 12 to 18 inches in diameter. The wood of this tree is soft, and when exposed to moisture it soon decays. It is very close-grained, and when cut in certain directions is remarkably beautiful, its fibres, owing to their peculiar arrangement, producing a surface variegated with undulations and spots. It is also susceptible of a very high polish. These qualities tend to render it a valuable acquisition to the list of American woods for ornamental purposes, for which it is very generally employed, and is well known in this country by the name of "Bird's Eye Maple." The wood of the Red-flowering Maple (*Acer rubrum*) is also employed for ornamental purposes, and is generally known by the name of "Curled Maple." The cabins of almost all American-built vessels are lined with these woods, or with mahogany inlaid with them, and they are also much used for making the finer parts of the furniture of houses.

The property of the sugar maple, however, from which it derives its name, is of perhaps more importance, in a commercial point of view, than its use as timber. I allude to its property of distilling a rich sap, from which sugar is largely manufactured throughout the United States. From two to four pounds of sugar can be extracted annually from each tree without hurting its growth. I had an

* Stevenson's Sketch of the Civil Engineering of North America. London: John Weale, 1838.

opportunity of making some inquiries regarding this simple process when on the banks of the river Ohio, where I saw it in progress. One or two holes are bored with an augur, at the height of about two feet from the ground, and into them wooden tubes, formed of the branch of some soft-hearted tree hollowed out, are inserted. The sap oozing from the maple flows through the tubes, and is collected in troughs. It is then boiled until a syrup is formed of sufficient strength to become solid on cooling, when it is run into moulds and is ready for use.

Such is a brief notice of some of the principal timbers of the United States, which, from their great abundance and variety, are suitable for almost every purpose connected with the arts, and thus serve in some degree to compensate for the want of stone, while at the same time they afford great advantages for the prosecution of every branch of carpentry, an art which has been brought to great perfection in that country. Many ingenious constructions have been devised to render timber applicable to all the purposes of civil architecture, and in no branch of engineering is this more strikingly exemplified than in bridge-building. Excepting a few small rubble arches of inconsiderable span, there is not a stone-bridge in the whole of the United States or Canada. But many wooden bridges have been constructed. Several of them, as is well known, are upwards of a mile and a quarter in length, and the celebrated Schuylkill Bridge at Philadelphia, which was burnt about two years ago, but was in existence when I visited the country, consisted of a single timber-arch of no less than 320 feet span. Canal locks and aqueducts, weirs, quays, breakwaters, and all manner of engineering works have there been erected, in which wood is the material chiefly employed; so that if we characterize Scotland as a stone, and England as a brick country, we may, notwithstanding its granite and marble, safely characterize the United States as a country of timber.

I shall only, in conclusion, very briefly allude to the *appearance* of the American forests, of which so much has been written and said, and on this subject I may remark, that it is quite possible to travel a great distance without meeting with a single tree of very large dimensions; but the traveller, I think, cannot fail very soon to discover that the average size of the trees is far above what is to be met with in this country. I measured many trees, varying from 15 to 20 feet in circumference, and the largest which I had an opportunity of actually measuring was a Button-wood tree (*Platanus occidentalis*) on the banks of Lake Erie, which I found to be twenty-one feet in circumference. I saw many trees, however, in travelling through the American forests, which evidently far exceeded that size, and which my situation, as a passenger in a public conveyance, prevented me from measuring.

M. Michaux, who has written on the forest trees of America, in speaking of their great size, states, that on a small island in the Ohio, fifteen miles above the river Muskingum, there was a button-wood tree, which, at five feet from the ground, measured 40 feet 4 inches in circumference. He mentions having met with a tree of the same species on the right bank of the Ohio, thirty-six miles above Marietta, whose base was swollen in an extraordinary manner; at four feet from the ground it measured 47 feet in circumference, giving a diameter of no less than 15 feet 8 inches; and another of nearly as great dimensions is mentioned by him as existing in Genessee; but these trees had perhaps been swollen to this enormous size from the effects of some disease. He also measured two trunks of white or Weymouth pine, on the river Kennebec, in a healthy state, one of which was 154 feet long, and 54 inches in diameter, and the other was 142 feet long, and 44 inches in diameter, at three feet from the ground. M. Michaux also measured a white pine which was 6 feet in diameter, and had reached probably the greatest height attained by the species, its top being 180 feet from the ground. It is difficult for an inhabitant of our island, without having seen the American forests to credit the statements which have been made by various authors, as to the existence of these gigantic trees of 180 feet in height (being about 40 feet higher than Melville's monument in St. Andrew-square, in Edinburgh;) but such trees undoubtedly do exist. Mr. James Macnab, of the Royal Botanic Garden, in a paper on the local distribution of different species of trees in the native forests of America,* mentions having measured numerous specimens of the *Pinus strobus* in Canada, which averaged 16 feet in circumference, and 160 feet in height; and one specimen, which had been blown down, and of which the top had been broken off, measured 88 feet in length, and even at this height was 18 inches in diameter.

The ascent of the sap in trees is a subject which has long occupied the attention of physiologists. Some difference of opinion, however, exists regarding it, and hitherto, it is believed, no very definite conclusions have been arrived at;—and although not strictly connected with the subject of this paper, I may be excused for remarking, that the quantity of sap required to sustain such enormous trees as these I have been describing, and the source and nature of the power by which a

* Agricultural Journal for 1835.

supply of fluid is raised and kept up, at the great height of 180 feet from the ground, are inquiries which, could they be satisfactorily solved, would form most interesting and instructive additions to our knowledge regarding vegetable physiology.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN THE 12TH OF NOVEMBER AND THE 20TH OF DECEMBER, 1841.

John Annes, of Plymouth, painter, for a new and improved method of making paint from materials not before used for that purpose. Nov. 12, 1841.

William Palmor, of Sutton-street, Clerkenwell, Middlesex, manufacturer, for improvements in tha manufacture of candles. (Being a communication from abroad, and partly by invention of his own.) November 17.

George Bent Ollivant and Adam Howard, of Manchester, mill-wrights, for certain improvements in cylindrical printing machinery, for printing calicoes and other fabrics, and the apparatus connected therewith, which is also applicable to other useful purposes. November 17.

John Steward, of Wolverhampton, Esq., for certain improvements in the construction of pianofortes. November 22.

George Lowe, of London, civil engineer, for improved methods of supplying gas under certain circumstances, and of improving its purity and illuminating power. November 24.

William Edward Newton, of 66, Chancery-lane, civil engineer, for certain improvements in the production of ammonia. (Being a communication from abroad.) December 1.

James Balderston, of Paisley, manufacturer, for certain improvements in machinery, or apparatus for doubling, twisting, twining, and finishing cotton and other fibrous substances. December 7.

James Colman, of Stoke, Holy Cross, county of Norfolk, starch-manufacturer, for improvements in the manufacture of starch. December 10.

Alexander Parkes, of Birmingham, for certain improvements in the production of works of art in metal by electric deposition. December 10.

William Irving, of Rotherhithe, gentleman, for improvements in the manufacture of bricks and tiles. December 10.

George Hickes, of Huddersfield, York, agent, for an improved machine for cleaning or freeing wool and other fibrous materiols, of burs and other extraneous substances. December 10.

Joseph Needham Taylor, of Devonport, n post captain in her Majesty's Navy, for a certain method or certain methods of abating or lessening the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state known by the term, "broken water," and thereby praventing the injury done to, and increasing the durability of, breakwaters, mole-heads, piers, fortifications, lighthouses, docks, wharfs, landing-places, embankments, bridges, or pontoon bridges, and also of adding to the security and defence of harbours, road-steads, anchorages, and other places exposed to the violent action of the waves. December 11.

Robert Holt, of Manchester, cotton spinner, and Robinson Jackson, of Manchester, engineer, for certain improvements in machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids. December 11.

William Hill Darker, senior, and William Hill Darker, junior, both of Lambeth, engineers, and William Wood of Wilton, in the county of Wilts, carpet-manufacturer, for certain improvements in looms for weaving. December 14.

Archibald Templaton, of Lancastar, silk-spinner, for a new or improved method of preparing for spinning silk and other fibrous materials. December 16.

James Colley March, of Barnstaple, surgeon, for certain improved means of producing heat from the combustion of certain kinds of fuel. Dec. 16.

Christopher Dumont, of Mentz, but now residing in Mark-lane, London, gentleman, for improvements in the manufacture of metallic letters figures, and other devices. (Being a communication from abroad.) December 16.

Morris West Ruthven, of Rotherham, engineer, for a new mode of encreasing the power of certain media when acted upon by rotary fans or other similar apparatus. December 16.

Heory Augustus Wells, of Regent-street, gentleman, for improvements in machinery for driving piles. (Being a communication from abroad.) December 17.

Henry Booth, of Liverpool, Esq., for improvements in the method of propalling vessels through water. December 17.

John Hale, of Breezes' Hill, Ratcliff Highway, sugar-refiner, for improvements in the construction of boilers for generating steam, and in the application of steam to mechanical power. December 17.

Henry Browne, of Codnor Park Iron Works, Derby, iron manufacturer, for improvements in the manufacture of steel. December 18.

William Newton, of 66, Chancery-lane, civil engineer, for certain improvements in engines to be worked by gas, vapour, or steam. (Being a communication from abroad.) December 20.

LIST OF PATENTS FOR IRELAND GRANTED IN NOVEMBER, 1841.

W. E. Newton, for certain improvements in the manufacture of fuel.

L. Kortwright, for certain improvements in treating and preparing the substance commonly called whalebone, and the fins, and such like other parts of whales, and rendering the same fit for various commercial and useful purposes.

R. L. Sturtevant, for certain improvements in the manufacture of soap.

M. J. Roberts and W. Brown, for certain improvements in the process of dyeing various matters, whether the raw material of wool, silk, flax, hemp, cotton, or other similar fibrous substances; or the same substances in any stage of manufacture; and in the preparation of pigments, or painters' colours.

W. Scamp, for an application of machinery, to steam vessels for the removal of sand, mud, soil, and other mattors, from the sea, rivers, docks, harbours, and other bodies of waters.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 961.] SATURDAY, JANUARY 8, 1842. [Price 3*d*.

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HARRIS'S NEW MARINER'S COMPASS.

Fig. 2.

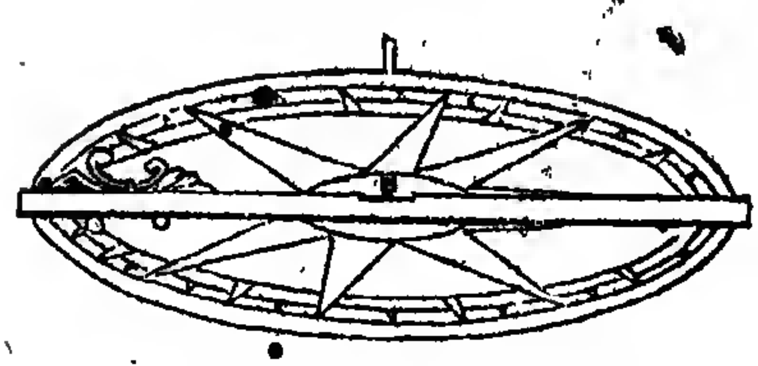
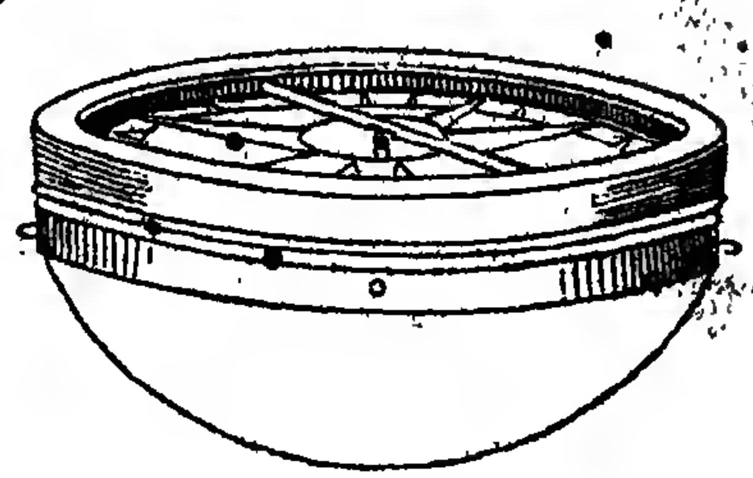


Fig. 6.



A Fig. 1. B

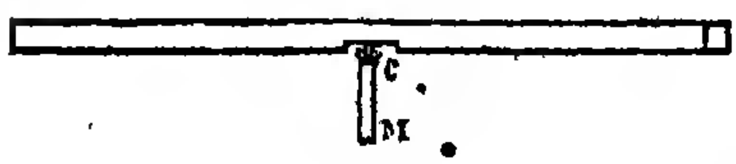


Fig. 3.

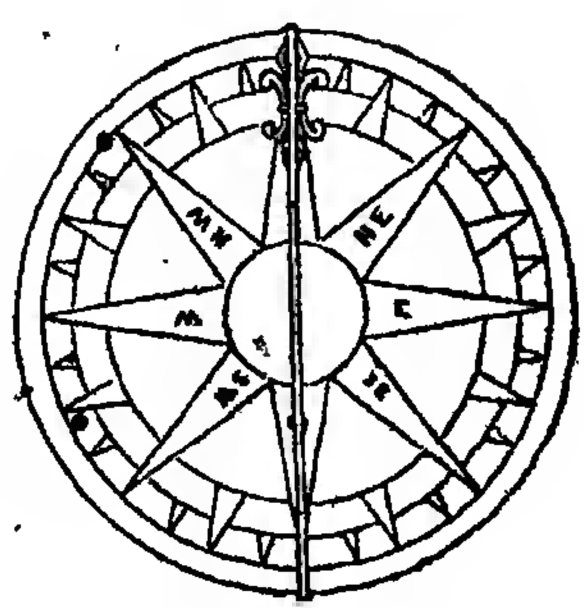


Fig. 4.

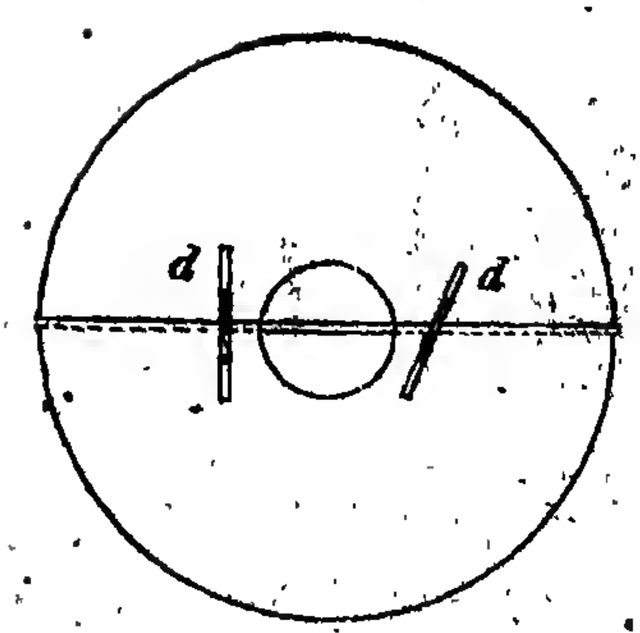


Fig. 5.

DESCRIPTION OF A NEW MARINER'S COMPASS, INVENTED BY W. SNOW HARRIS, ESQ., F. R. S.

In the year 1825, Mons. Arago discovered the influence of metallic bodies in arresting the vibration of the magnetic needle; he showed that the amplitude of the arcs of vibration when the needle oscillated within a ring of metal, became sensibly reduced, and the needle tended rapidly to a state of rest; he further discovered, that when a magnet was delicately balanced on a fine centre, and placed near the surface of a rapidly revolving metallic plate, it would be soon greatly disturbed, would begin to oscillate, and would, if the motion of the plate were sufficiently rapid, be dragged round with the plate.

The results were further pursued and investigated in this country by Sir John Herschell, Mr. Babbage, and also by Mr. Harris, who repeated the experiments in vacuo; their researches led to the development of new facts of great practical consequence.*

Faraday, with a power of physical research peculiar to himself, has since shown that the force which thus fetters and restrains the magnetic oscillation, is not the result of ordinary magnetic action, but is dependant on the generation of electrical currents induced by the magnet whilst in motion, in the metallic ring; and which he terms Magneto Electric Induction; no attractive power between the bodies being observable in a state of rest.

These facts having been fully established, we are enabled to apply the general principle, with perfect safety, in restraining the inconvenient oscillations of the compass on ship board, so as to confine it as nearly as possible to its natural direction, without in any way interfering with its delicacy, or any liability to error from the restraining cause, and thus avoid the disturbing motion, which often arises from the rolling and pitching of the ship.

This is the new feature in the compass invented by Mr. Snow Harris, and which is now about to be described.

The compass needle consists of a straight bar A B, fig. 1, about 7 inches long, ½ an inch wide, and ⅛th of an inch thick, it is made of fine steel, well tempered and hardened throughout its whole length; it is placed edgeways, and is delicately balanced on a fine point at C, resting on a centre of agate. Instead of the ordinary compass card, a transparent circular disc of talc, figs. 2 and 3. is attached to the bar, at its under edge, on which the different points, &c, are either painted in transparent colours, or otherwise laid on it, on very thin paper, so that the whole is quite transparent; and in order to ensure and regulate the horizontal position of the whole, at any time or place, there are two small sliders of brass, *d d*, fig. 4, underneath, and on each side of the centre, so contrived as to slide and turn with friction into any required direction by means of two slits in them and small stop screws.

The compass bar with its talc circle beneath, is now placed centrally within a ring of hammered or rolled copper as in fig. 5, the poles of the bar, which project a little beyond the card, being distant from the interior of the ring, about ⅛th, or ¼th of an inch. This copper ring is about 1¼ inch wide, and ⅜th thick; it is turned up and finished in a lathe, so as to be perfectly circular; the centre piece M, fig. 1, carrying the needle, is supported on a cross bar *m n*, fig. 5, attached to the ring, and the centre part *c*, accurately adjusted in the lathe.

The whole is finally set within a glass bowl or other case, according as it is required to light the compass from beneath or above, and placed in gimbles in the usual way,—the perfect transparency of the single disc of talc renders the compass card very visible and clear when lighted from beneath.

The great steadiness of this compass under all sorts of motion is very remarkable. It has been successfully tried in a few ships of the navy, and is still on trial. The needle being placed on its edge, it is liable to little error in its magnetic line; it has, besides, great magnetic energy and great delicacy of suspension, and is unembarrassed by a heavy card—whilst at the same time, the magneto-electrical induction on the copper ring effectually preserves its natural direction undisturbed. These are advantages of no ordinary kind.

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* Philosophical Transactions for 1825 and 1831, pts. 1 and 2.

Mr. Harris has shown (Transactions of the Royal Society for 1831,) that when a magnetic bar oscillates freely within a series of concentric rings of copper, accurately and closely fitted one within the other, the restraining force of the copper with a given magnet, is inversely as the squares of the distances from the pole of the bar, and directly as the quantity of copper within the sphere of its action, the matter being supposed to be condensed into an indefinitely thin ring, and taken at some intermediate, or mean distance within the surface, where the sum of the forces may be supposed to produce the same effect as if exerted from every part of the mass, and that hence the energy is also directly as the density. He also found that with a given magnetic tension in the bar, the restraining force no longer increased sensibly after a certain number of rings, that in fact the number of rings requisite to exhaust, as it were, the magnetic force, varied in some ratio of the power of the magnet; thus with the bar employed, no sensible increase of energy in the whole was observable, after the tenth ring, the effect being the same with ten as with any greater number of rings.

In the application therefore of a copper ring to the purpose of restraining the oscillations of the compass at sea, it is desirable to have the poles of the bar as near as we can to the interior of the ring, to have the copper as dense as possible, and to give it greater or less thickness, in proportion to the power of the compass bar. Much has been said, and many experiments tried, with a view of determining the best form for a compass needle; it will, however, probably be found, that the simple bar above dedescribed is, upon the whole, not only the most accurate, but in every respect the best. Its form greatly simplifies the workmanship necessary to its construction, and admits of the various other scientific processes upon which its action depends, being easily and perfectly carried out. If the steel be well chosen, and be properly tempered, such a bar is susceptible of a very high degree of magnetic energy, which it will be found to completely retain.—*Transactions of the Royal Cornwall Polytechnic Society.*

FREEZING OF WATER PIPES.

Sir,—We may soon expect further evidence of "winter's icy hand" being upon us; and amongst the many shapes in which this evidence will be afforded is, the annoyance to housekeepers by the freezing and bursting of water-pipes.

Some people look upon this as a necessary consequence of frost; a sort of "compliment of the season," to be regularly expected, and by no means to be guarded against. Other persons desire to be freed from this annoyance, of which they have a very keen remembrance from previous visits; and, in order to provide a remedy, they wrap a slight twist of hay, a few old rags, or a solitary piece of matting, round that portion of the service-pipe which is exposed to the inclemency of the weather. These matters are all very good non-conductors, and would effectually answer the purpose, if applied in *sufficient bulk;* but it almost invariably happens that this circumstance is either overlooked or misunderstood. In fact, the difficulty of surrounding the pipe with a sufficient quantity of non-conducting material amounts, in many cases, almost to an impossibility.

The plan which I have successfully adopted is, to inclose the external portion of the water-pipe in a deal case or trough fitted to the wall, about four inches square, which is filled with finely-sifted coal ashes, which is a most excellent non-conductor, and perfectly surrounds and encloses every portion of the pipe.

My water-pipe is in some degree sheltered, and for more exposed situations a larger mass of ashes might be required; but it is very easy to be on the safe side, by using a little excess.

I have in a few instances seen Russell's welded iron gas tubing used for external service-pipes, for water, and its adoption for this purpose, in all exposed situations, would prevent the continual burstings which severe weather always produces, and prove a great saving to the proprietor.

I remain, Sir,

Yours respectfully,

W. BADDELEY.

29, Alfred-street, Islington.
December 27, 1841.

The members of the Institution of Civil Engineers, having given an extensive publicity, as well as a sort of implied sanction, to the contents of a paper lately read before that body, "On the Properties and Chemical Constitution of Coal," by a Mr. Charles Hood, abounding in the grossest errors, theoretical and practical, and which, if allowed to pass unnoticed and uncorrected, might obstruct the progress of those just views of the subject, developed by our correspondent, Mr. Williams, in his admirable work On Combustion, and further enforced in the series of papers by that gentleman, now in course of publication in our journal—we readily publish at the request of an esteemed correspondent, (not Mr. Williams,) the following notes on the paper in question by Dr. Kane, of Dublin; which if they do not touch all its many vulnerable points, will, at least, serve to give a tolerably correct notion of its general character. The Mr. Hood, whose ignorance is here exposed, is the same person* to whom the Council of the Institution of Engineers, in some fit of somnolency, voted, about a year ago, one of their pretty medals for an essay of kindred worth, on warming and ventilation. Whether it be hot coals, or hot water, this gentleman meddles with, it seems to be equally his fate to *burn his fingers.*

Notes by Dr. Kane, on Mr. Hood's Paper.

1st. The light carburetted hydrogen is not, as asserted by Mr. Hood, among the *first* products of the distillation of coal; but it is formed, on the contrary, only when the volatile resin-oils and the olefiant gas (which are, in reality, the first products,) are decomposed by sweeping over the ignited surface of coal, or metal of the retort, or its contents. When olefiant gas is passed through tubes heated to bright redness it deposits half its carbon, and, without changing its volume, is converted into light carburetted hydrogen. If it be frequently passed backwards and forwards through the tube, it deposits all its carbon, and the residual gas (the volume of which is doubled) is found to be pure hydrogen. The products of the distillation of coal may be arranged according to the temperature at which they may be produced, as follows:—

1st. Lowest temperature .	Solids, as naphthaline, solid resins, and fluids, with high boiling points.
2nd, or next temperature .	Fluids which are very volatile.
3rd Stage . . .	Olefiant gas.
4th Stage . . .	Light carburetted hydrogen gas.
5th, or highest temperature,	Hydrogen gas.

In practice, however, the results of two or three stages are always mixed together.

2d. Light carburetted hydrogen is more difficult to inflame than olefiant gas (Mr. Hood's paper states the reverse.) Davy has fully proved this; and I have verified his result, that a mixture of air and olefiant gas will explode at a temperature that will not produce action on a mixture of air and light carburetted hydrogen.

3rd. The heat produced by olefiant gas, in burning, is greater than that produced by the combustion of the same volume of light carburetted hydrogen in the proportion of 27 to 18. The weights are then, however, as their specific gravities—that is, as 98 is to 56. If we plunge a piece of bright red charcoal, or a bright red iron rod, into a mixture of olefiant gas and air, it will explode; but we may immerse the charcoal and iron, white hot, into a mixture of light carburetted hydrogen without any danger. The whole use of the safety lamp depends on this.

4th. Mr. Hood is quite in error respecting the source of the ascensional power of gas and its law; it has nothing to do with the law of tranquil diffusion into space, with which he has confounded it.

5th. He is also wrong respecting the source of the great heating powers of the resin fuel. The idea of an increased draught from the quantity of vapour formed is also quite incorrect.

6th. There is nothing gained by the production of a gas requiring less oxygen (as Mr. Hood supposes) than olefiant gas does, for there would then be less heat produced. The quantity of heat evolved in the burning of any body is proportional to the quantity of oxygen absorbed,

and it is hence the interest of the operator to use as much oxygen as possible, instead of the reverse. With regard to the law of the quantity of heat evolved being proportioned to the quantity of oxygen consumed, the following extract from the article "Combustion," in my *Elements of Chemistry*, (now in the press,) will be sufficient to explain it.

"The determination of the quantity of heat produced during the combustion of a given quantity of a combustible substance is a problem of great importance in the arts, as on it depends the economic value of all varieties of fuel. The plan generally followed has been to burn the substance, by means of the smallest quantity of air which is sufficient, in a vessel surrounded, as far as possible, with water. If it be found that the burning a pound of wood heats 37lbs. of water from 32° to 212°, no idea can be thereby formed of the quantity of heat evolved. But if, in another trial, it be found, that the burning of a pound of charcoal raises the temperature of 74lbs. of water through the same range, it follows, that the charcoal has double the calorific power of the wood. True relative numbers can thus be obtained, although they have, independently, no positive signification. The results obtained in this way, by various experimentors, have been exceedingly discordant; but, by the late researches of Despretz and of Bull, a very interesting rule has been obtained. It is, that in all cases of combustion the quantity of heat evolved is proportional to the quantity of oxygen which enters into combination. Thus Despretz found that there are heated from 32° to 212° by

1 lb. of oxygen,	uniting with	hydrogen,	29½ lbs.	of water.
1 ,,	,, ,,	charcoal,	29 ,,	,,
1 ,,	,, ,,	alcohol,	28 ,,	,,
1 ,,	,, ,,	ether,	28½ ,,	,,

giving, as a mean, 28¾lbs. as the quantity of water heated from 32° to 212° by the heat evolved in the combination of one pound of oxygen. This rule, however, is liable to some very curious changes," &c. &c.

Laboratory of the Apothecaries' Hall, Dublin.

INQUIRY INTO THE CAUSES OF THE DIFFERENCE BETWEEN THE CORNISH LIFTING AND CRANK ENGINES. BY MR. W. RADLEY C. E.

Sir,—Observing in a recent number of your Journal a requisition by yourself for some engineer to furnish your pages with an exposition of the discrepancy of result between the Cornish lifting and crank engines, together with an explanation showing in what consists the difference of power elicited, under similar circumstances, by those two modifications of the steam-engine, I take the liberty of communicating to you some ideas on the subject, and also some experimental data, of which some were suggestive of, and others suggested by, these ideas.

Some years ago I conceived the notion of converting the momentum of the steam-driven piston to the purpose of die-sinking for calico printers, by affixing a stuffing-box to the cylinder bottom, for the passage of a punch-socket attached to the piston; and I found that when the motion of the piston was regulated by a crank and fly-wheel, and allowed to descend through 11/12ths of its stroke, ere coming by means of the punch to a dead set, I could not produce half the effect obtained when the arrest of impetus took place at half the stroke. The reason of this will be obvious to your readers, without any elaborate explanation.

Some little time after this, whilst observing the motions of a lifting engine, on the Cornish plan, which has a 10-feet stroke, I became acquainted with the fact, that the *motion of the piston was two-fold;* that is, *the down-stroke was a separate and distinct function, perfect in itself*, and the *up-stroke was merely a preparation* for the former, and had otherwise no connection with it. Pursuing my observations a little farther, I found that this engine made nearly six strokes per minute, and that each complete movement occupied, as near as may be, 10 seconds; of these 10 seconds, 5 seconds were occupied by the pause, rather more than 2½ seconds by the up-stroke, and the remainder by the down-stroke.

From these facts it follows, of neces-

sity, that the calculations of Mr. Pilbrow and all others upon this subject must be erroneous; and that in the instance of the Wheal Vor Borlase's engine, quoted by Mr. Pilbrow, (No. 947,) instead of the mean velocity of the piston being stated at $10 \times 5{\cdot}67 = 56{\cdot}70 \times 2 = 113{\cdot}40$ feet per minute, it ought to be $10 \times \frac{60}{2\frac{1}{4}} = 27 = 270$ feet per minute. Now, if we compare this with the developed power of the Cornish crank engine, also quoted by Mr. Pilbrow, whose strokes were 9 feet each, and 8·8 of them in the minute, making about 150 feet per minute, (which Mr. Pilbrow calculates to be only about $\frac{1}{12}$ths of the duty of the lifting engine,) by taking $\frac{270}{12} = 22{\cdot}5 \times 7 = 157{\cdot}5$, we obtain a theoretical result much in accordance with the absolute duty. The higher ratio of the Cornish lift may be safely ascribed to the difference of friction in the two cylinders, one being 84, the other 32 inches; coupled with the difference in number of strokes between the two engines.

I will now subjoin a tabulated view of a comparison betwixt the two engines; only supposing, in order to aid the comparison, that the crank had the same stroke as the lifting engine, viz., 10 feet, and each 6 strokes per second. I have divided the down-stroke, in each case, into 10 equal parts of the crank pin's gyration, equal to one foot of the piston's descent.

Cornish Lifting Engine.			Cornish Crank Engine.		
Time in ¼-seconds.	Velocity of Piston, in Equal Times, expressed in inches.	Portion of Stroke.	Time in ½-seconds.	Velocity of Piston, in Equal Times, expressed in Inches.	Portion of Stroke.
Seconds.	Inches.	Feet.	Seconds.	Inches.	Feet.
¼	9	$\frac{1}{10}$	½	3¾	$\frac{1}{10}$
¼	13	$\frac{2}{10}$	½	8⅝	$\frac{2}{10}$
¼	13½	$\frac{3}{10}$	½	13⅛	$\frac{3}{10}$
¼	14	$\frac{4}{10}$	½	16½	4
¼	14	$\frac{5}{10}$	½	18	5
¼	14	$\frac{6}{10}$	½	18	6
¼	14	$\frac{7}{10}$	½	16½	7
¼	13	$\frac{8}{10}$	..	13⅛	8
¼	12	$\frac{9}{10}$	..	8⅝	9
¼	3½	10	..	3¾	10
2½	120	10	5	120	10

By this table it will be seen, that neither of the two pistons moves through equal spaces in equal times; and that not only is this discrepancy greatest in the crank-guided piston, but that the unguided piston has a higher mean speed.

I will not vouch for the absolute accuracy of all I have here set forth; but, as it is the principle which forms my theme, I crave the indulgence of your liberal and better informed readers.

On what ground Mr. Pilbrow can, under these circumstances, claim any superiority for his engine I am at a loss to conjecture; but I would, before concluding, inquire what is the cause, nature, and real mode of operation of the pause in the lifting engine? I think it can be easily shown, when the cause is considered, that this function, or absence of function, can contribute nothing to the efficiency of the engine. For, let us suppose there is a vacuum in the condenser, equal to 27 inches of mercury, and that the cylinder at the top of the stroke is filled with steam of 6 inches of mercury; in that case, if the plunge-weight, which is to balance and overcome these forces, is inadequate to the task, then the valve between the cylinder and condenser will not open, and this it is which is the occasion of the pause. As the steam in the cylinder, by the tendency to an equation of temperature, becomes attenuated, the forces productive of the pause give way, the valve opens, and at that instant the piston is in rapid motion. What has been taking place in the condenser in the

mean while? Why, a vitiation of the vacuum, in consequence of the evolution of air from the injection water, and other causes. This evolution cannot be rectified by the air-pump during the stroke, and it is of no use for the next; so that, after all, this much-talked of pause may be an evil rather than a benefit, and may arise from a due calculation by the engine-maker, &c., as to the balance of forces.

I am yours truly,

WILLIAM RADLEY.

London, January 1, 1842.

ON THE COMBUSTION OF COAL AND COKE —CARBONIC OXIDE, OR COKE GAS. BY C. W. WILLIAMS, ESQ.

[In continuation from page 5.]

Sir,—In my last week's contribution to your Magazine I referred to the existence of a combustible gas in furnaces, which had hitherto escaped the attention of practical men—was denied by many—and doubted by most—outside the laboratory. I allude to carbonic *oxide*. I transmitted you a letter of a most important character on this subject, setting the whole question at rest, not only as regards the existence of this gas in a useful or available quantity, but of its direct application in the generation of even an intense heat.

Now, the most important considerations, as regards the conversion of this gas to available purposes, relate to the quantity of air to be admitted in effecting its combustion, with the time when and place where such admission is rendered necessary. I will therefore briefly examine these points, as they arise out of the consideration of the constituents of this gas, and the circumstances attending its generation and combustion.

In my treatise On the Combustion of Coal, I considered it of the last importance to dwell on the nature and properties of this "carbonic oxide," and the importance of providing for its combustion. On these points I will, if possible, refer in my next. I will now, for perspicuity sake, and for the better consideration of our subject in a practical point of view, distinguish this gas from the other combustible gases produced in a furnace, by a term which, though chemically it may be objectionable, yet practically will be found to have its value.

I will, then, divide the combustible gases, which are to be converted to the purposes of heat in the furnace, into three classes—First, Bi-carburetted Hydrogen; secondly, Carburetted Hydrogen; and, thirdly, Carbonic Oxide. The first two I will call the *coal* gases, and the third a *coke* gas; meaning by the latter term to convey the idea, that the two former are generated in the practical combustion of coal, and that in the process of combustion of the coke, or solid carbonaceous residue of coal, the latter is produced.

Now, with respect to the quantity of air required for the combustion of this carbonic oxide, or *coke gas*, the weight of carbon which it contains being the same as that which went to the formation of carbonic acid, the quantity of air must necessarily be the same, to provide an equal weight of oxygen. But since the carbonic acid, in its conversion into carbonic oxide in the furnace, has doubled its volume, it follows, that the *volume* of air required must be in accordance with this chemical transformation of the acid into the oxide. In other words, that each cubic foot of carbonic oxide, taking the carbon thereof at 6, by weight, will require a volume of air, the oxygen of which will be 8, being one-half that required in the generation of carbonic acid; so that, if the solid carbon of a ton of coals requires 240,000 cubic feet to convert it into carbonic acid, the carbonic oxide generated from such, (supposing it all to be so converted, and which is probably the case in large and deep furnaces,) would be 120,000 cubic feet.

With respect to the time when and place where such air should be admitted—it is clear that this should be regulated by the place where the gas is to be encountered—namely, beyond the bridge; inasmuch, as it is only in the passage from the incandescent fuel in the furnace, and after it has escaped from such fuel, that it can be met. This at once neutralizes the erroneous inference arising out of the supposed absence of a combustible gas, when the "coal" gas has all been evolved; and the supposed injurious effect of air, if admitted at such time. Practically, the existence of this gas is unnoticed by engineers, and consequently, the necessary demand for air denied. When, however, we consider that this "coke gas" is generated when

the "coal gas" has ceased to exist; and that its quantity is in proportion to the quantity and incandescence of the ignited fuel on the bars, we shall see that the demand for air for the former will arise in the same rate and degree as that for the latter shall have ceased. Thus this demand is in admirable harmony with nature's uniformity in the supply of air, and relieves us much from the supposed inequality in the demand in furnaces, arising out of an unequal generation of combustible gases. In searching for the reason why the existence of the "coke gas" has been overlooked in practice, and the demand for air denied—this can easily be accounted for as regards close furnaces, from these circumstances: 1. That until it has been converted into flame, it is necessarily invisible; and, 2. That the place where it is so converted, is beyond the reach of observation—being beyond the bridge, to which part there is no usual access or means of seeing what is going on. In smelting furnaces, or in all operations where this gas arises in large quantities and meets the air at its exit from the top, it is strange that it should have been so long neglected, and that coke, which it is asserted burns without flame, should yet be attended with so large a body of it, without exciting attention to its heating powers, and the causes and circumstances under which the body of unquestionable flame is generated from a fuel which is said to burn without it. I propose continuing this subject in my next communication.

I am, yours, &c.

C. W. WILLIAMS.

Liverpool, January 4, 1842.

PATENT SOLAR LAMP.

Sir,—Our attention having been drawn to a letter in your publication of the 18th instant, headed "The Cap or Deflector Lamp, commonly called the Solar Lamp," and signed "A Constant Reader," in which letter our names are made use of, we shall be obliged by your inserting this communication in your next number.

It is generally known, that we are the proprietors of the patent right of the Solar Lamp, and "A Constant Reader" is evidently aware of this fact; the manifest object of his letter being to lead the public to suppose that the solar lamp is one of Upton and Robert's contrivances.

All that we think it necessary to state is, that we have some time since commenced an action, which is now pending against the same Mr. Upton, whose name is here mentioned in connection with Roberts (who is since dead,) for infringing our patent rights in the solar lamp, by selling a contrivance called "Young's Patent Oxydator;" and on the trial of that action, he will have a much better opportunity of showing whether the solar lamp is one of Upton and Roberts's contrivances, than can be afforded in any other way.

It is not our intention to be drawn by Mr. Upton, or his friend, "A Constant Reader" into a correspondence on the merits of the question between him and us, but we think it desirable, that the public, to whom "A Constant Reader" has addressed his observations, should be aware of the real state of the matter, and that we are at this moment taking against Mr. Upton the same course which we have already pursued against other parties who have infringed our rights, by seeking damages against him by legal proceedings.

Trusting to your sense of justice for the insertion of this letter, we are, Sir,

Your obedient servants,

TIMOTHY SMITH AND SONS.

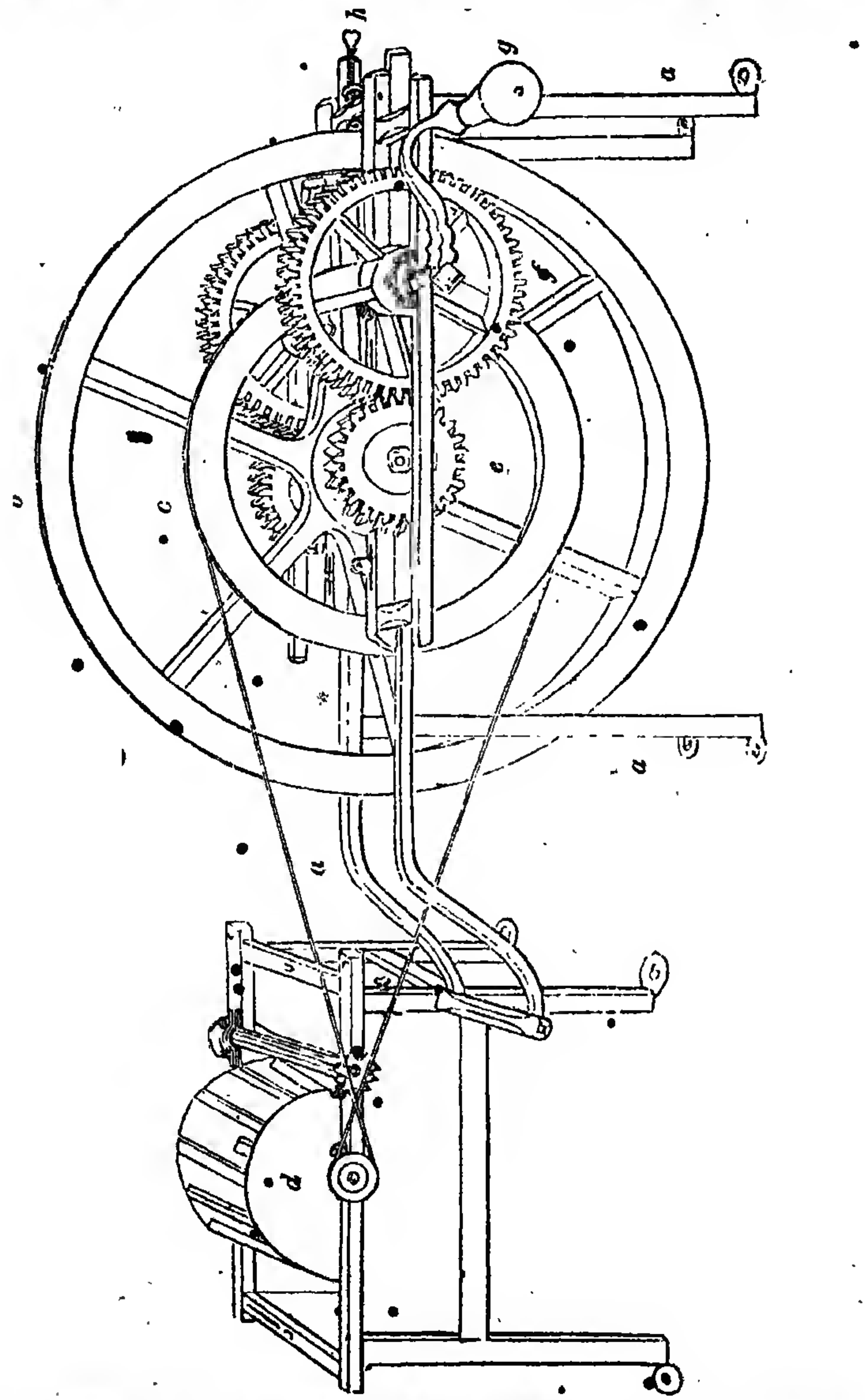
Birmingham, December 29, 1841.

PLOWMAN AND QUARTERMAN'S MANUAL POWER FOR THRESHING MACHINES.

(Registered Pursuant to Act of Parliament.)

In our last volume (page 504) we published a description of a new "Horse power" for threshing machines, designed by Messrs. Plenty, of Newbury. The accompanying engraving represents a new "manual power" adapted to similar machines recently introduced by Messrs. Plowman and Quarterman of Oxford. It consists of two horizontal bearers mounted upon suitable supports *a a*; upon these bearers a sliding frame is placed, which carries the bearings of the several axles. The centre of the frame is occupied by a large fly-wheel *b*, which carries a drum *c*; upon the prolonged axis of the fly-wheel a small spur wheel, or pinion *e*, is placed upon each end, which pinions revolve in the outer compartments

or wings of the sliding frame. In suitable bearings, immediately behind, and gearing into the former, two large spur wheels, *f*, are placed, furnished with winch handles *g*. On turning these handles a rapid motion is given to the fly-wheel and drum, which is communicated to the threshing-machine by a belt



from the drum passing round its pulley *d*.—At the end of the bearing frame there is a screw *h*, working through a fixed collar, and taking into a nut on the upper sliding frame; by turning this screw to the right hand or to the left, the upper frame is made to slide backwards or forwards upon the lower, and by this means

the band, or belt is kept constantly tight.

The performance of one of these machines on the large scale, has given the highest satisfaction to competent judges, and it appears well adapted to supply a desideratum in many agricultural localities, — advantageous employment for willing able-bodied men during the cessation of profitable out-door labour.

A TRIP IN THE "ARCHIMEDES."

(From the Bristol Magazine.)

Dear Mr. Editor,

On presenting your note of introduction to Mr. Smith, the morning of the departure of the *Archimedes*, from Bristol, I was very kindly welcomed on board, and having ascertained that the steward's arrangements would not be disconcerted by an extra hand at the *mess*, at which I undertook to perform my share of the duty without skulking, I soon felt myself as much at home as if I had been quartered on the beef and pork for a voyage to the East Indies.

Our party consisted of Mr. Smith, the inventor of the screw, in *propria persona*, a gentleman friend of his (who was disposed to go "a pleasuring," like myself, to enjoy the inviting breezes and invigorating fogs of an honest old-fashioned November, on "the broad, the open sea"), the Captain, the managing engineer, Mr. Ray the pilot, and your humble servant, all, with perhaps one exception, practical fellows, able to look a nor'-wester in the face without winking; and when the hauser was let go off Rownham, at exactly half-past ten A.M.,—for my own part, I felt ready for anything, from "pitch and toss to manslaughter."

You will remember that the morning of the 20th November came in fine and soft, and as I was going down to the *Archimedes* from the city, I was apprehensive that the run round to London would be a very dull and common-place affair, affording but small opportunity of testing the properties of the screw, more than could be done in a river. By the time, however, that we reached Kingroad it was piping pretty fresh from the south-west, and when we rounded Posset Point, exactly one hour from the Basin, it was blowing hard right a-head, and as it looked black and murky to windward, I began to entertain hopes that I should have something to say to you ere we reached London.

The wind continued to increase as the day advanced, and when we reached the Holmes, at two o'clock, it was blowing a whole gale, and Mr. Ray, calling a council of war, represented, that as we should soon have the whole flood tide to contend with, during which it was not to be supposed that any vessel, against such a wind, could make much progress, and as it was necessary to husband the coal, of which we had only a limited quantity, he would advise our running into Pennarth, and seeing how it would be on the next ebb, as he was sure it would be "nothing but a real dirty night." This advice was adopted, and we let go our anchor in Pennarth Roads at half-past two o'clock, four hours from the time of leaving Bristol Basin, the last three of which it had been blowing very hard against us.

The justice of Mr. Ray's observations was soon established; for shortly afterwards the *Victory* and the *Bristol* bore up and came into the roads also, both vessels anxious to make good their time, and the latter with only a short distance (to Swansea) to run. The next morning (Sunday) it was blowing still very hard, with very unsteady wind, veering about from south-west to north-west, and the pilot still discountenanced our getting under weigh. The *Victory*, however, made another attempt, and succeeded, as I have since learned, in getting so far as Milford in the next twenty-four hours; but the *Bristol* remained, as well as ourselves, until the Monday morning, when, the wind having abated, though still westerly and fresh, we weighed anchor, resolved to take a final leave for that voyage of Pennarth, which we did exactly at twenty-five minutes past seven, in company with the *Bristol*.

At eight o'clock, hove the log, and found her going seven knots, wind west south-west, very fresh, engine making twenty-four revolutions per minute. At noon, strong winds and rainy weather. Half-past twelve, abreast of the Foreland, strong gale and heavy sea, and the *Bristol* we observed bearing up again for Cardiff (where, I have since understood, she landed her passengers); as, however, we were doing well, we kept on without the slightest deviation from our course till we reached Lundy Island, under which we anchored, at a quarter after seven the same evening, the wind continuing to blow a strong gale from west north-west to west. We accomplished the whole distance from Cardiff to Lundy at the average rate of five miles an hour, against such weather and a whole flood tide; Mr. Ray, the pilot, and several of the hands being perfectly astonished at the ease with which a true course was steered in weather in which, he asserted, many large and powerful steamers could not have been kept head to wind at all.

We lay at anchor, under Lundy, all that night and part of the next day, during which I got on shore to visit *the natives*. There

are, it seems, only thirty inhabitants on the island, apparently a healthy and a happy little colony; they told me, such a thing as a doctor on the island had never been heard of. Two, at least, of the lot are both pretty and agreeable, I can say that from my own observation, (this, of course, is not a part of "the log;") but as I suppose you want an account of the *Archimedes*, and not of Lundy Island, I proceed to inform you that, at about noon, on Tuesday, the 23rd of November. the wind hauled so far to the northward, as to admit of our setting the canvass, and we got under weigh at one o'clock P. M., a tremendous sea still tumbling into the chops of the Channel, from the westward, on account of the previous heavy gales from that point, notwithstanding which we found her going eight and a half knots by the patent log. At six the wind had become so strong, that we took in the main spencer. At eight, a heavy squall struck us, and blew away the jib; at half-past eight, a heavy gale and head sea, speed by log six and a quarter knots. I was never more pleased, myself, than when I came on deck in the midst of this hubbub, to see how beautifully this little vessel was performing her part; at this time she was making good six knots, with a terrible head sea on, and blowing too hard to carry any canvass. She was *making excellent weather*, and a boy might steer her; and, from first to last, the engine never varied above three or four strokes per minute, at no time exceeding twenty-five, nor being down so low as twenty, the whole voyage. This, to me, appeared the more singular, as I had observed such a striking difference in the action of the paddle-wheel engines, at different times, which labour dreadfully in a heavy head sea, and are liable to *run away* when scudding in similar weather, requiring the steam *shut off*, on account of the paddles being sometimes wholly out of the water. I have known the mighty *Western* reduced down to five strokes per minute, and even less, by the strength of the opposing wind and sea, though, when doing her best, she makes sixteen and seventeen strokes per minute. Talking of the *Great Western*, by the by, puts me in mind of the first gale of wind I experienced on board of her. At the time I speak of, the people were getting the yards down, and I was on the spar-deck, forward, lending a hand, when two or three seas, successively, slapped in over us, almost taking my breath away, and scarcely giving me time to recover it again; one of the hands, an old whaler, who stood near me, however, said to me, quite coolly, "Hold on, and never mind her, sir—she'll come up to blow presently;" thus identifying her, as a sailor delights to do, with a thing of life and habits.

At half-past eleven at night we made the Longships; at midnight, very heavy squalls, with rain and hail. Rounded the Longships at about half-past three in the morning, and ran up the Channel all that day, at the rate of about nine knots. At half-past two in the morning of Thursday, we met a strong breeze from the eastward, notwithstanding which we were off Beachey Head by eight, when we sent down the gaffs and fore-yard, the wind continuing against us till two P. M., when it abated, and shortly afterwards fell calm. At half-past two, we hove-to off Sandgate for a couple of hours; and at seven, anchored in the Downs, after a run of thirty-seven hours' steaming from the Longships. Here the weather was quite calm, but very thick, and we remained at anchor until the following morning. On Friday morning, at six, got under weigh, and, though constantly delayed by a dense fog, we were at Gravesend by four in the afternoon, and safely moored at Blackwall by half-past six on the same evening, (Friday, Nov. 26,) in six and a quarter days from Bristol, only three days nine hours of which we had been absolutely under weigh, accomplishing a distance of over six hundred miles, about half of which was against strong head winds and a heavy sea.

I don't imagine that the above needs any commentary, Mr. Editor. All I know is, that we passed every sailing vessel and steamer we fell in with between Bristol and London, and accomplished the voyage without unpleasantness of any sort, saving the weather alone. The vessel performed her work with uniform regularity, and every one on board was delighted with her; and if you have a doubt on any point, I refer you to Mr. Ray, the pilot, from whom Mr. Smith took a certificate of her behaviour during the severe gales in the Bristol Channel.

It should be borne in mind that the *Archimedes* is a vessel drawing eleven feet of water, and that she has little more than one-horse power to every four tons register; and I do not believe there is in the kingdom a paddle-wheel steamer, of the same proportion of power to tonnage, and the same draft of water, that would have *a chance* with her against a strong wind and heavy sea. At any rate, I am sure there is not one that I would be so well pleased to be on board of in such weather; nor need you fear saying too much in favour of an invention, which is only kept from general adoption, either because it is unknown, or because people do not desire to know it. It is to me a complete puzzle; nor can I account for the indifference with which the steam-navigation world appears hitherto to have regarded it, —so superior as it is, in every respect, as

far as my experience goes, to the mode of propelling vessels by side paddle-wheels.

Depend upon it, Mr. Editor, the *Great Western* Company know what they are about. It is no speculative point of questionable advantage upon which the excellence of the *screw propeller* rests; it is a strikingly superior, as well as an entirely new, invention. Propelling vessels by side paddle-wheels, (though not perhaps by steam,) is as old as the pyramids; but it is left to the *screw propeller*, I firmly believe, to exhibit the real triumph of steam and modern skill on the ocean, over every thing that was ever dreamt of before.

I am, dear Sir, yours truly,

TOM CRINGLE, Jun.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

EZEKIEL JONES, OF STOCKPORT, MECHANIC, *for certain improvements in machinery for preparing slubbing, roving, spinning, and doubling cotton, silk, wool, worsted, flax, and other fibrous substances.* Enrolment Office, December 10, 1841.

The first of these improvements is applied to the roving machine, commonly known as the bobbin and fly frame, generally employed for producing the finer rovings, and is designed to obviate the uncertain rotation which occurs in the usual mode of conveying motion by means of the cone and strap.

The second improvement consists in a method of regulating the varying speeds of the bobbin and flyer, so that each succeeding layer may be placed with equal tension, and in regular succession during the filling of the bobbin, from the commencement of the bare spool to its greatest diameter when full.

Another movement is designed to regulate the distribution of layers on the surface of the spool or bobbin.

EDWARD PALMER, OF NEWGATE-STREET, GENTLEMAN, *for improvements in producing printing surfaces, and in the printing china, pottery ware, music, maps, and portraits.* Enrolment Office, December 12, 1841.

The first of these improvements consists in obtaining printing surfaces on copper, or other metallic or conducting surfaces, by the known power of electrotype, in the following manner. A composition is first made of two parts white wax, two parts lard, and one part of ivory black or lamp black; these ingredients are boiled together, and, when cold, ground to a proper consistency for painting with olive oil.

A plate of metal, of proper dimensions, is then taken, and the subject required drawn upon it, and submitted to the electrotype process.

The second improvement consists in a mode of obtaining metallic plates with raised printing surfaces, by means of which china, music, maps, &c., may be printed. This process closely resembles the former, but in this case, instead of the black composition, a white one is employed, composed of two parts wax, two parts lard, and one part sulphate of lead.

ROBERT ORAM, OF SALFORD, LANCASTER, ENGINEER, *for certain improvements in hydraulic presses.* Petty Bag Office, December 12, 1841.

These improvements consist in a simple addition for the purpose of causing the ram to move with greater speed, when light articles are being pressed, until a point is attained when the full power of the machine is required.

For this purpose, a small stationary ram is inserted through the bottom of the water cylinder, into the common ram, which is bored to receive it, and is thus converted into a second cylinder. The interior of the ram may be a cylinder of four inches diameter only, while that of the water cylinder is ten inches; water is, therefore, in the first instance, pumped into the interior of the ram, until the utmost pressure is obtained; the water is then pumped into the ordinary cylinder, when the speed becomes diminished, and the power proportionately increased, say in the ratio of 16 to 100.

There is a provision for admitting water to flow into the outer cylinder, to occupy the vacuum which would otherwise be occasioned by the ascent of the ram.

The claim is to the boring out of the ram to convert it into an interior cylinder, and the introduction of the smaller stationary ram into the same, in order that the strokes of the pump may tell quicker upon the goods under pressure.

JOHN HAUGHTON, OF LIVERPOOL, CLERK, MASTER OF ARTS, *for improvements in the method of affixing certain labels.* Enrolment Office, December 18, 1841.

This invention has reference to the penny and two-penny new postage labels, and its essential peculiarity is said to be, the placing a letter in a machine which contains a liquid and suitable apparatus for damping, and causing such a motion to a part of the machine, that the liquid shall be brought into contact with the letter, so as to damp the precise fitting motion. And so placing labels and a letter, respectively, in a machine, as to be able to communicate such a motion, that

a label shall be brought into forcible contact with the letter, and be affixed to the exact portion of it previously damped. The distinctive principle of this invention may, it is said, be variously carried out, and three forms of apparatus are described at great length. The first is a small machine, called a *damper*, in which the upper right-hand corner of the letter is inserted and damped; the second is the *stamper*, in which the letter previously damped is brought in contact with a postage label, properly disposed, which becomes fixed thereunto by pressure communicated to the upper part of the apparatus. Another form of apparatus, called a *labeller*, performs both the damping and stamping process.

WILLIAM PETRIE, LATE OF CROYDON, BUT NOW OF CONDUIT-STREET, gentleman, *for improvements in obtaining mechanical power, which are also applicable for obtaining rapid motion.* Enrolment Office, December 18, 1841.

These improvements consist in the application of the differential pulley or Chinese windlass, by means of a system of internal differential gearing to cranes, windlasses, capstans, &c.

On the terminating crank of an axle are placed two toothed wheels fastened firmly together or made in one piece, both being free to revolve together on the crank. One of these wheels is larger than the other. The smaller wheel revolves in a fixed internal-toothed wheel, supported externally with its centre in a line with the axle, its internal radius being equal to that of the small crank wheel added to the length of the crank. The larger wheel revolves within another toothed wheel fixed by its centre at the extremity of a removeable axle which lies beyond the crank, in a straight line with the cranked axle, so that the internal wheel lies flat against, but does not quite touch the fixed internal wheel. The internal radius of this wheel (which is called the resistance wheel,) is equal to that of the large crank wheel added to the length of the crank. An ordinary barrel is placed upon the axle of the resistance wheel for winding up a rope, chain, &c. When the cranked axle is made to revolve, the resistance wheel will revolve with greater power, and consequently slower, provided that *double the length of the crank, multiplied by the difference between the diameter of the small and large cranked wheels*, be less than *the diameter of the resistance* wheel multiplied by the diameter of the small crank wheel. The patentee claims the combination of two wheels of different diameters on a crank, and working into two corresponding internal wheels, so placed, that one being fixed, the other will revolve in the manner described.

The advantages of this contrivance over the ordinary system of gearing, are stated to be, its greater compactness, the unlimited power obtainable by only two moving points besides the axle to which the moving force is applied, and the necessity for very few bearings; and hence its superior simplicity and lightness when great power is required, the whole force being obtained in the space generally allowed for a single wheel.

THOMAS WALKER, OF NORTH SHIELDS, ENGINEER, *for improvements in steam-engines.* Enrolment Office, Dec. 18, 1841.

The patentee states that the object of his improvements is to prevent the exhausting steam of one cylinder, from interfering with the other cylinder while in full power, as he conceives that when the steam of one cylinder is exhausting it will pass through the eduction pipe to the other cylinder where it is not wanted, and destroy, in a measure, the power of that cylinder for a time (the quicker the engines goes, the greater will be the resistance to each piston alternately by the other's exhausting steam); to avoid this, the patentee uses separate exhausting ways, and so prevents the exhausting steam of one from interfering in the least with the others.

We really know not which to admire the most, the extreme *simplicity* of this invention, or, the brevity of the specification, of which the above is not an *abstract*, but a *copy*.

In the drawing accompanying the specification, the two cylinders of a locomotive engine are shown, each having its separate exhaust-pipe proceeding into the funnel.

JOSEPH GAUCI, OF NORTH-CRESCENT, BEDFORD-SQUARE, ARTIST, AND ALEXANDER BAIN, OF WIGMORE-STEET, CAVENDISH-SQUARE, MECHANIST, *for improvements in inkstands and inkholders.* Enrolment Office, December 21, 1841.

The first of these improvements consists in placing a small force-pump at the bottom of the interior of the inkstand, the piston of which is raised or depressed by means of a screw, or other suitable contrivance; when the piston is at the top of the working barrel, the ink flows into it through small openings made in its side for that purpose, which ink, on the descent of the piston, is forced up a tube into the inkholder, or dipping-place. In a second modification, the piston-rod works through a stuffing-box in the closed top of the pump-barrel, and raises the ink in its upward movement. In a third modification, the pipe leading perpendicularly from the inkholder forms the piston-rod, the piston being affixed to its lower end, and working in a well at the bottom of the inkstand.

A second improvement consists in form-

ing the inkstand of a horizontal cylinder, with a projecting spout or dipping-place on one side. When in a position for use, the ink flows into the dipping-place; but when done with, the inkstand can be turned on its axis, the whole of the ink flows back into the interior, and the spout rises up against an ornamental stop, which closes the orifice, preventing evaporation of the ink, or collecting of dust. In another arrangement of this inkstand, the front is a circular glass plate, with a dipping-place, which turns in a fluid-tight joint, and allows the dipping-place to be raised up against the stop, as before, while the main body of the inkstand and its contents remain stationary.

The claim is, 1. To a mode of constructing inkstands by applying a force-pump below the surface of the ink, in the vessel containing the ink; 2. To a mode of constructing inkstands by causing the ink vessel, (or part thereof,) containing ink, to move partly round, and, by the gravitating property of the ink, to supply ink to an inkholder for use.

John Lee Stevens, of King Edward-street, Southwark, General Agent, and John King, of College-hill, London, Printer, *for certain improvements in candlesticks, and other candle-holders*. Enrolment Office, December 23, 1841.

These improvements consist in raising the piston or plate, on which the bottom of the candle rests within the socket of the candlestick, by a spiral motion. In some cases, a screw thread is cut upon the prolonged stem attached to the piston; in other cases, a thread, on the periphery of the piston itself, works in a spiral groove within the socket.

A gradual vertical motion is thus given to the piston by means of a screw, instead of being raised, as heretofore, by the direct pressure of the finger. Several different modifications of arrangements for this purpose are shown.

The claim is, 1. To the application of an internal and an external screw, for the purpose of causing a vertical movement on turning the nosel; 2. To the raising the piston, or candle, by means of a spiral screw working within a tube or collar, as described.

Robert Stephenson, of Great George-street, Westminster, Civil Engineer, *for certain improvements in the arrangement and combination of the parts of steam-engines of the sort commonly called locomotive engines*. Rolls' Chapel Office, December 23, 1841.

The first of these improvements relates to the disposition and arrangement of the wheels of six-wheeled engines, and consists in disposing the axis of the hinder wheels beneath the hindmost end of the cylindrical part of the boiler; the said axis passing horizontally across in front of the foremost end of the fire-box, instead of behind the hindmost end thereof. But the straight axis of the foremost wheels is disposed as usual, or nearly so, that is, horizontally across beneath the foremost end of the cylindrical part of the boiler, so as to be beneath the stuffing-boxes of the steam cylinder. The cranked axis of the main or propelling wheels is disposed horizontally across, beneath the cylindrical part of the boiler, at a suitable place in the interval between the foremost and the hindmost axles; such interval being that usually observed in six-wheeled engines. In a locomotive engine constructed agreeably to this improvement, the boiler will be longer than in the ordinary six-wheeled engines, and its evaporative powers proportionably increased.

The second improvement is equally applicable to both four and six wheeled engines. It relates to the position of the slide-valves, steam-chest, &c., and consists in placing the slide-valves in vertical planes at the sides of the steam cylinders, so that the direction of the sliding motion of such valve, and the central line of each valve-rod, will intersect the central line of the main axis of the crank at the point where the eccentric is placed. In this case the eccentric rods are joined directly to prolongations of the valve-rods, without the usual intermediate levers or axes; and one steam-chest, placed between the two cylinders, contains the slide-valves belonging to each.

The third improvement relates to a method of working the feed-pumps for supplying the boiler with water, and is applicable to all engines having two sets of eccentrics for working the slide-valves; it consists in jointing the piston-rods of the two feed-pumps to the half-hoops belonging to the eccentric rods, which are only used to work the slide-valves when the motion of the engine is reversed; so that the short reciprocating motion of these two eccentrics works the feed-pumps and keep the boiler supplied with water.

RECENT AMERICAN PATENT.

[From the *Franklin Journal*.]

Curled Hair Carding Machine, *Francis Harding*. Upon a cylinder about 2 feet in diameter, and similar to the cylinder of a carding machine, slats are attached, which are about 2 inches in width, and 4 inches apart—these slats are covered with cards having two or three rows of strong wire teeth set in stout leather, and bent, or hooked, forward. Over the cylinder, attached to arch pieces, are six stationary

slats, provided with teeth similar to those on the cylinder, but with the hooks turned the reverse way. These slats are connected with the arch pieces by means of springs, so as to give them some play; the teeth on these slats are of the same kind as those of the cylinder, but they are less and less coarse as they recede from the feed apron and approach a brush cylinder, which is opposite a feed apron, by which the machine is supplied.

The claim is to the combination of the stationary and revolving cards, arranged, constructed, and operating as described, and in combination therewith the revolving cylinder of brushes, each brush consisting of a single row of bristles.

The difference between this machine and the carding, or heckling, machines, previously in use, will be manifest from the fact that neither of these machines would perform the operation of picking curled hair; whatever similarity there may be between them, it must be plain that they are by no means identical.

THE LATE GREAT WESTERN RAILWAY ACCIDENT.

We are informed; and have reason to believe, that we made a mistake in stating, in our last number, that, "just before the starting of the very luggage train that met with the late disastrous accident, the propriety of placing the passengers next the engine and tender" had been fully discussed between the three principal officers of the railway, the engineer, secretary, and superintendant; and that Mr. Brunel represented, at the inquest on the bodies of the sufferers, that the passenger truck had, on that occasion, been actually placed "in the middle of the train." The luggage-train to which Mr. Brunel alluded was, it appears, that of the evening, or rather morning, *following* the accident. We were led to refer Mr. Brunel's statements, to the luggage-train which actually encountered the accident, from a confusion which prevails as to the times spoken of, in the newspaper reports of the evidence given at the inquest, from which alone our information was derived.

To the question, "Whether any means were provided for enabling the carriages to sustain, without damage, any collision which might happen to them?" we remain, and, we fear, are likely ever to remain, without any distinct and satisfactory answer. We believe the only *true* answer that can be given is—*none whatever.* Neither on the Great Western Railway, nor on any other which we know of, has any thing like adequate attention been paid to the protection of passengers from the *consequences* of collisions. Such care as railway directors, managers, and engineers have hitherto taken to provide for the safety of their customers has been almost solely directed to the *prevention* of such accidents—it being taken too much for granted, on all hands, that, when they do occur, some slaughter, more or less, is inevitable. And yet, most certain it is—unless we are to abandon all faith in the resources of science and art—that means may be found to render innocuous the worst collisions which can happen on railways, in the course of their ordinary traffic. It is more a question of expense to the Companies, than any thing else; but the expense of such a system of buffers as we recommended in our last would not be great; and were it even ten times greater than it is likely to be, that ought to be no reason with any company for refusing to adopt it.

NOTES AND NOTICES.

The Smoke Nuisance.—A public meeting is to be held on the 12th of January, at the Music Hall, in Leeds, for the purpose of considering the propriety of adopting some course by which the smoke issuing from the various steam-engines which abound in that neighbourhood can be burnt or prevented. The Hall is to be open on two days preceding the meeting for patentees or other inventors, in priority of application, to arrange for exhibition models, plans, sections, or diagrams, and it is arranged (that the whole question may be thoroughly considered) for each inventor to have an opportunity of briefly explaining his apparatus. Questions may be asked in explanation, but it is not intended to allow the inventors to question each other in public, because such course might lead to personal remarks. W. Beckett, Esq., M.P. for Leeds, has promised to take the chair.

Remarkable Magnetic Disturbance at the Greenwich Observatory.—On the 25th of September last, a most extraordinary disturbance of the magnetic instruments was noticed at the Magnetic Observatory attached to the Royal Observatory of Greenwich. Within eight minutes of time the declination needle changed its position more than 2½ degrees (having passed in both directions the range of the observing telescope, which includes the angle), the vertical force was increased by more than 1-40th of its whole value, the instrument having then reached the extremity of its range; and the horizontal force was increased about 1-30th of its whole value. During the appearance of an aurora on the morning

when the needles were in an agitated state, the declination needle in less than three hours traversed an arc of 34 minutes. At 2 o'clock p.m., Gottingen mean time, it was evident that all the needles were affected by some unusual cause of disturbance; and from this time to the discontinuance of the observations (some hours) two persons were constantly engaged, one taking the observations with the vertical force magnetometer, the other those of the declination needle and of the horizontal force magnetometer. The day (September 25) was cloudy throughout; about 9 h. p. m. a few bright streamers were seen through the clouds, then nothing more till 11 h. p. m., when an auroral arch, about 24 degrees high, was visible for a short time.

Ancient Stocking Frames.—A very singular lot of frames was offered lately by auction, consisting of a number of frames from Godalming, in Surrey, many of them are more than 120 years old. Among the rest we were sorry to observe the celebrated frame "Magog," the widest stocking frame in the world, it being 54 inches on the needles. This giant of a frame was built by Mr. Horton, the noted patentee, in London, about the year 1777. It was originally a knotted frame, and was calculated to make silk breeches, then in the height of fashion. About the year 1790, Mr. Horton being a partner, it was removed to the Keeley factory, Godalming, where it made fleecy blankets and great coats until the year 1838, a period of 48 years. So great was the width, that the London giant frightened all the Nottingham purchasers, and there was never a bid for poor old "Magog." When this is known "half Godalming will be in tears," as he is known to be a "reg'ler good'un." The sale of these frames shows the vicissitude of human affairs. Though the stocking frame was invented at Calverton, yet stocking frames were worked in Godalming before they were in Nottingham, as in 1665 there was only one shop in this place. In the reign of Anne, there were nearly as many stocking frames in Godalming, Guildford, and 17 villages around, as in London.—*Nottingham Review.*

Invention of the Steam Engine.—M. Delcoluze has lately made a discovery among the manuscripts of Leonardo da Vinci, carrying back a knowledge of the steam-engine to at least as far back as the 15th century. He has published in the *Artiste* a notice on the life of Leonardo da Vinci, to which he adds a fac-simile of a page from one of his manuscripts, and on which are five sketches with the pen, representing the details of the apparatus of a steam-gun, with an explanatory note upon what he designates under the name of the "Architonnerre," and of which note the following is a translation:—"Invention of Archimedes. The Architonnerre is a machine of fine copper, which throws balls with a loud report and great force. It is used in the following manner:—One-third of this instrument contains a large quantity of charcoal fire. When the water is well heated, a screw at the top of the vessel which contains the water must be made quite tight. On closing the screw above, all the water will escape below, will descend into the heated portion of the instrument, and be immediately converted into a vapour so abundant and powerful, that it is wonderful to see its fury and hear the noise it produces. This machine will carry a ball of a talent in weight." It is worthy of remark, that Leonardo da Vinci, far from claiming the merit of this invention for himself, or the men of his time, attributes it to Archimedes.—*Galignani's Messenger.*

Rifles Inferior to Plain Muskets.—Mr. Greener, the author of an excellent Treatise on Fire-arms, affirms that "the supposed advantages of the rifle exist more in imagination than in reality." (*Times, Dec. 20.*) "A well-constructed cylindrically-bored barrel will," he says, "project a ball further than the best rifles; under the same circumstances, fully 100 yards further, and that with only a very trifling addition of elevation. The disadvantages of the rifle, as a military arm, are very numerous, and it can only become useful in the hands of a man well skilled in its use; and it is, for this reason, unfit to be placed in the hands of a body of men of indiscriminate ability. So convinced am I of this, that I would undertake to teach any number of men, taken promiscuously from a regiment, to contend, with a well-constructed musket, against any similar number armed with the best made rifle yet produced, quickness and accuracy combined."

Introduction of the Hot Blast in Plymouth Dockyard.—Great improvements have been made in the north smithy of this dockyard, in superseding the blowing machines by the introduction of the fire blast, worked by steam-power. All the old bellows are removed from the fires or forges; air pipes, conveying the blast produced by the fans, are fitted in their places, and the working of the fans has commenced. The building, in which are the fans and the steam-engine that drives them, is erected without, adjoining the smithy. The air-drains or tunnels, into which the air produced by the motion of the fans is forced, are dug out of the solid rock, and are carried along through the shop, under the surface of the floor at the backs of the forges, where openings are cut, and pipes introduced to convey the air to the fire. The principle of generating the blast, and its practical utility, have been proved to be far superior to the old method in every respect; for, by the continual and steady blasts of the fan, the heats are much more quickly produced than by the blast of the bellows; consequently, the heats in the course of the day are more numerous, and the metal in heating and forging does not diminish so much. A great saving, therefore, is effected in labour and material, and nearly double the quantity of work can be performed with more than the former facilities. The air-pipes occupy almost as small a space as the nose of the old blowing machines, thereby affording valuable room for additional forges, which the increasing manufacture of anchors at this smithy, and the extra quantity of work capable of being performed, have rendered necessary to be erected, and which could not have been built, had not the old bellows been removed. It was feared that much annoyance would be experienced from the noise of the vibration, caused by the immense velocity at which the fans are driven, which is said to be productive of great inconvenience in other similar constructions. Precautions were taken to prevent this. The fans are enclosed in the smallest possible space by walls; and this, with the solid foundation on which the building stands, and its permanent construction, has had the desired effect, so that not the least noise produced by the working of the fans and engine in this building can be heard in the smithy.—*Times.*

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HENSON'S PATENT CONDENSING STEAM-ENGINE.

Fig. 1.

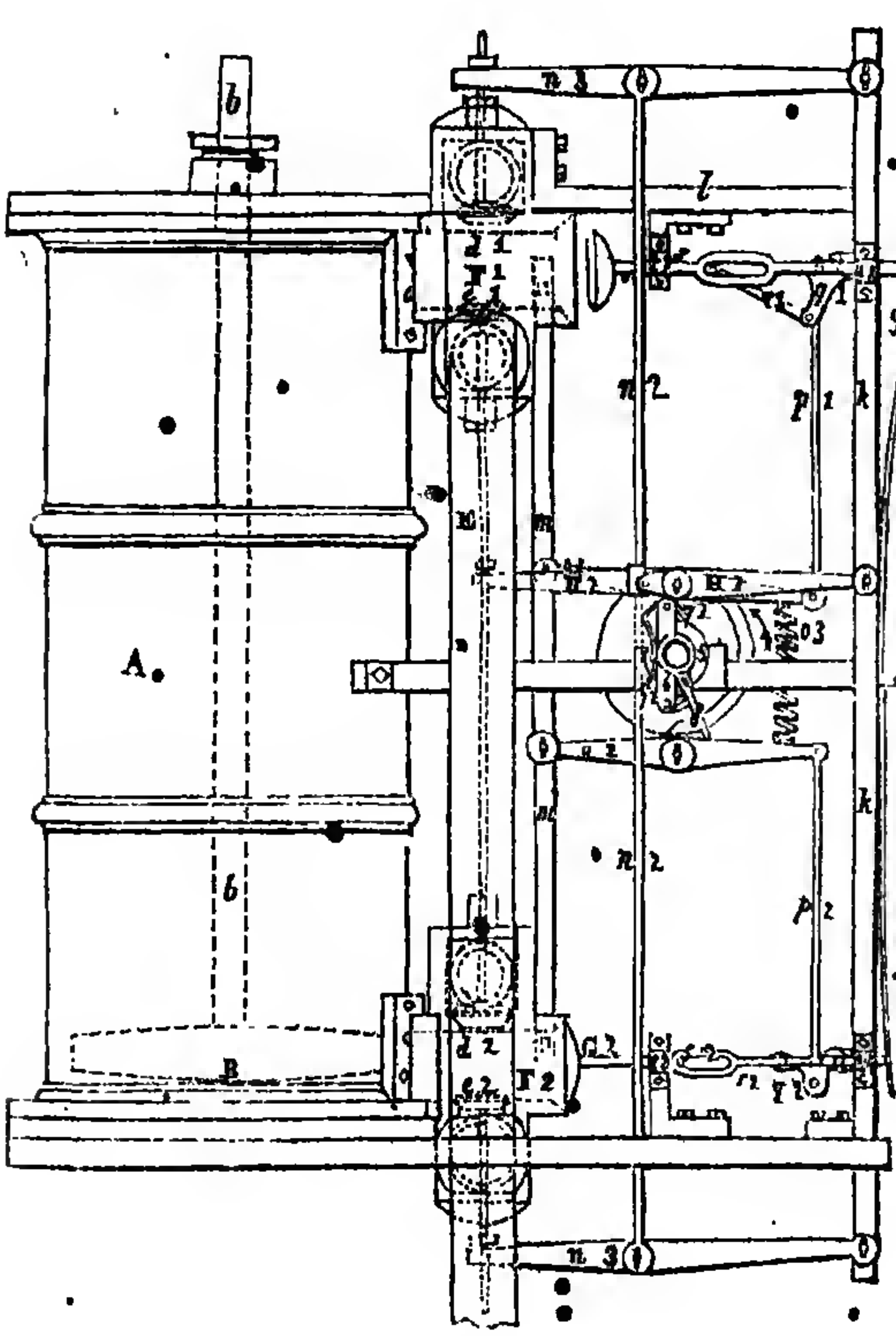


Fig. 2.

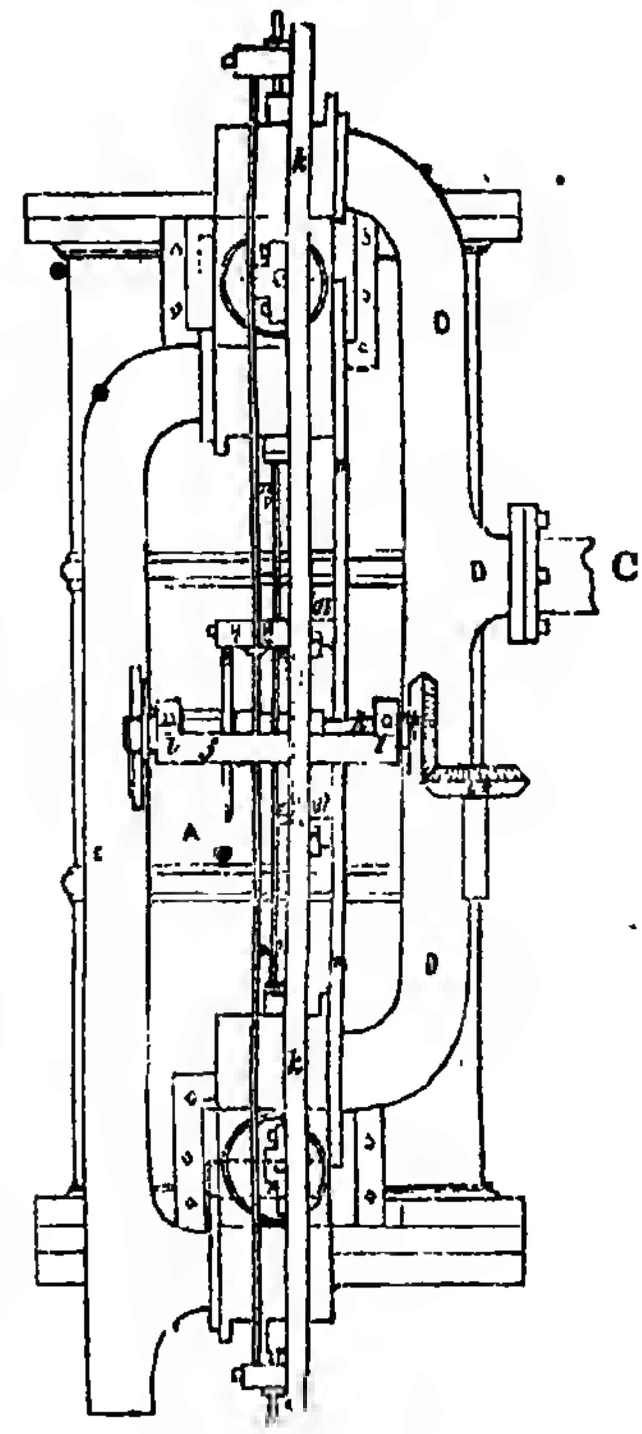


Fig. 3.

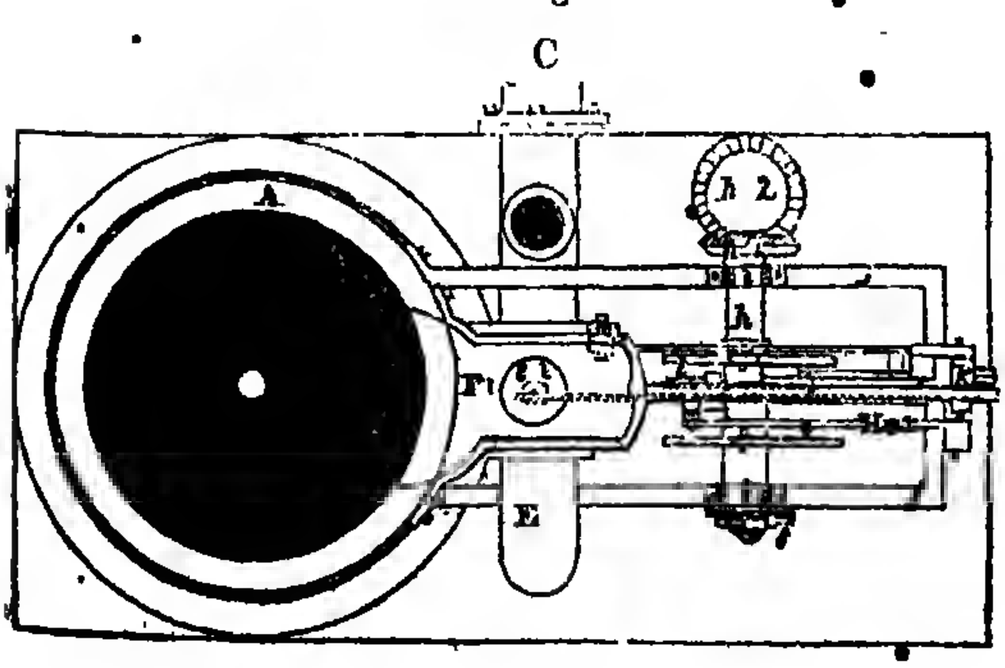
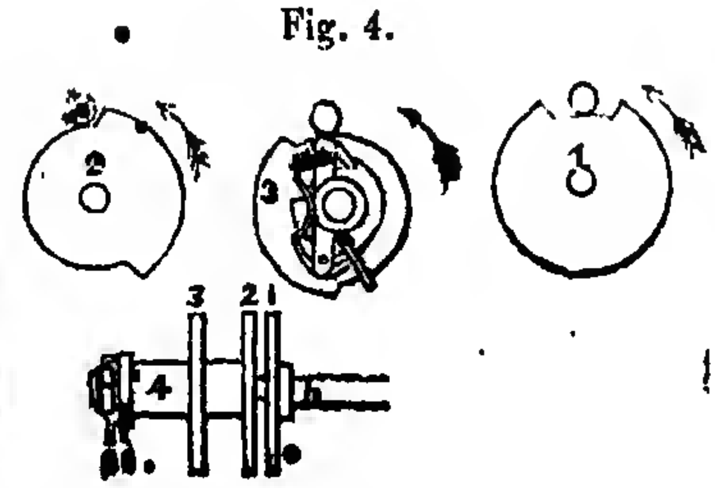


Fig. 4.



HENSON'S PATENT CONDENSING STEAM-ENGINE.*

Description by the Inventor.

The improvement by which this engine is distinguished from others, consists in permitting the escape from the cylinder, or from the steam passages between the cylinder and the condenser, during a very short interval of time near the termination of each single stroke of the engine, of so much steam as shall leave the remainder in the cylinder but little above atmospheric pressure, and condensing that remainder by the means ordinarily used in condensing engines.

Fig. 1, represents a front view of a steam-engine cylinder, with apparatus attached for working the common valves as well as that required for the peculiar purposes of this invention. Fig. 2 is a side view; and fig. 3 is a horizontal plan of the same. Fig. 4 exhibits separately the cams which are shown in connexion with other parts by the figures 1,2, and 3.

A is the cylinder of the steam-engine.

B is the piston, and *b* the piston rod.

C is the steam pipe leading from the boiler.

D is the induction pipe.

E is the eduction pipe, understood to be continued as usual to the condenser.

d 1 and *d* 2 are the induction valves.

e 1 and *e* 2 are the eduction valves.

F 1 and F 2 are the chambers through which the steam pipes communicate with the cylinder; and respecting which I would remark, that I prefer that the openings from them into the cylinder, and the chambers themselves, should be larger than usual.

G 1 and G 2 are the escape valves; they cover corresponding openings in the chambers F 1 and F 2, by which part of the steam escapes into the atmosphere, according to the design of my invention.

g 1 and *g* 2 are springs which assist the return of the valves G 1 and G 2 to their seats.

Having now indicated the principal parts of the apparatus, I will point out their movements; and in so doing I shall always suppose that the steam used is considerably above atmospheric pressure. During the greater part of the downward stroke of the piston B, the upper escape valve G 1 is held firmly to its seat by the action of parts to be described hereafter. When the piston has nearly reached the end of its stroke, the pressure is removed from the valve G 1, on which the excess of the pressure of the steam in the cylinder, over that of the atmosphere, opens the valve; and so much steam escapes as that the pressure of the remainder is equal to that of the atmosphere, together with the force of the spring *g* 1; the valve G 1 then closes, and the eduction valve *e* 1 is opened, which admits the remaining steam to the condenser, and a vacuum is formed in the cylinder in the ordinary manner of condensing engines. In the upward stroke, the corresponding parts perform similar functions, as will be readily understood. By this means, the pressure of the atmosphere is removed from the side of the piston opposite to that on which the steam acts, which has not ordinarily been done in steam engines worked with high pressure steam. The movements of the valves above described are effected in the following manner by the parts I now describe. *h* is a shaft connected by the wheels *h* 1 and *h* 2, or in any other convenient manner, with the main shaft of the engine, so as to make equal revolutions with it. *i i*, are the bearings in which the shaft *h* turns; *j j* bars of the frame supporting the said bearings, and which are themselves secured by one end to the cylinder A; and by the other, to the upright, or standard, *k k*. *k k*, is an upright or standard affixed near its lower end to the base plate of the engine; and *l* is a stay by which the upper end of *k*, *k* is firmly held in its place; *m* is a bar secured to the steam chests F 1, F 2, for supporting the centres of the levers *o* 1, *o* 2. H 1 and H 2 are two levers, whose centres are in one line, and are supported by the upright *k*. H 1, the shorter of these, carries a truck or roller, which applies to the cam No. 3. H 2, the longer lever, carries a similar truck, which applies to the cam No. 2; *n* 1, *n* 1, is a rod which passes through stuffing boxes in the valve chests F 1, F 2, and is attached to the valves *e* 1 and *e* 2, being itself actuated by the lengthened extremity of the lever H 2 pressing against the collar formed on the rod; *n* 2, *n* 2, is a rod attached to the lever H 1, and ac-

* Patented July 16, 1841.

tuating the levers n 3, n 3, whose centres are in the upright K, and whose extremities move the valves d 1, c 2 by their stems moving through stuffing boxes in the steam chests F 1, F 2, as shown in the drawing. The moving apparatus for actuating the valves, which I have so far described, only effects such opening and closing of the valves as is common to, and required by, all condensing engines; the shape of the cams No. 2 and No. 3, necessary for that purpose is shown by fig. 4.

The cams 2 and 3 are made fast on the tube 4, which is put over, and can turn on the shaft h, and on which is the journal which carries the front end of the compound shaft. The plate 5 is also secured on the same tube, but is outside of the journal; beyond it projects the shaft h, on which is fastened the cross bar 6, carrying at each end the click 71 and 72; in the edge of the plate 5 is formed a long notch or fall, as shown in the figure; and on its face is fastened the stud and handle 8. When, as in the figure, the cams are intended to turn with their upper edges moving from right to left, the stud 8 is brought against that part of the cross bar which appears lowermost in the position of the parts as drawn, and the click 71 is forced by its spring into the fall or notch, so as to abut against one end of it; when it is desired that the engine shall turn the other way, the cams will be brought into the right relative position by releasing the click 71, and turning round the plate 5, and tube 4, with the cams it carries, until the stud 8 comes against the other part of the cross-bar 6, and the click 72 abuts against the other end of the fall in the plate 5. o 1, o 2, are levers carrying trucks which apply to the cam No. 1 respectively at the opposite ends of its vertical diameter, and by which through other parts the escape valves G 1 and G 2 are at proper times confined and set at liberty. They are connected with each other by a spring, o 3; p 1, p 2, are connecting rods, q 1, q 2 are levers, whose centres are supported by the upright k, and which are connected by the rods p 1, p 2, with the levers o 1, o 2, respectively, as shown in the drawing; r 1, r 2, are levers jointed by one end to q 1 and q 2, and each carrying at its other end a strong pin or stud, which enters the slot in the stem s 1 or s 2 of its respective escape valve G 1 or G 2; t 1, t 2, and u 1, u 2, are the bearings in which the stems s 1, s 2 of the escape valves slide.

It will be readily seen that when, as in the position represented in the drawing, the smaller part of the cam No. 1 comes to the truck or lever o 1 (which should be when the piston is near the bottom of the cylinder), that lever will be depressed, and by means of the rod p 1 will bring down the joint by which the levers q 1 and r 1 are attached to each other, and thus withdraw the stud on the lever r 1 from its pressure against the end of the slot in the stem s1 of the valve G 1; the valve being thus released gives way to the pressure of the steam in the cylinder, and permits the escape of part of it as above described. During this time the larger part of the cam No. 1 holds down the lever o 2, by which the rod p 2 has been made to depress the joint of the levers q 2 and r 2, so as to bring them nearly into a continued straight line, and by this means the stud in the lever r 2 is strongly pressed against the end of the slot in the valve stem s 2, and the valve G 2 is firmly held in its place against the pressure of the steam in the cylinder. A further rotation of the cam holds both valves close, and at the end of a semi-revolution the upper valve is held close and the lower one set at liberty, which the action of the engine as before explained requires. The spring o 3 raises the lever o 2 when permitted to do so by the hollow in the cam No. 1.

I will now recapitulate briefly the course of the valve movements, and the way in which they are effected. Beginning with the piston near the bottom of the cylinder, as shown in the drawing, the escape valve G 1, is first released by the truck on the lever O 1 falling into the hollow of the cam No. 1, and the excess of steam escapes into the atmosphere at once, or along such pipe as may be used to conduct it; an instant after, and nearly at the moment the piston reaches the very extremity of the stroke, the eduction valve e 1, and the induction valve d 2, are raised by the rise on the cam No. 2 operating on the lever H 2; about the same time the escape valve G 1 has closed by the pressure of the atmosphere and the spring g 1, and is soon held fast again by the cam No. 1. This state of things continues during almost the whole time of the up-stroke. When the piston has

nearly reached the top of the stroke, the escape valve G 2 is released by the hollow in the cam No. 1 then coming to the truck or lever O 2: when the piston comes to the end of the up-stroke, the rise on the cam No. 3 raises the induction valves *d* 1 and the eduction valve *e* 2, the valves *e* 1 and *d* 2 having been just closed by the fall in the cam No. 2, and the escape valve G 2 having also closed, and being held fast by the cam No. 1. No further change takes place until the piston arrives near to the bottom of the cylinder, when the series of changes again commences.

Remarks by Mr. John Chapman, C. E.

[Abridged from Report to the Proprietor of the Patent.]

The principal feature of Mr. Henson's plan I understand to be this: the permitting the escape of as much steam, or nearly so, as will escape into the atmosphere, from the cylinder, near the end of the stroke, and condensing the remainder of the steam in the ordinary manner.

It is obviously important to ascertain in what time any given quantity of steam, of a certain density at the beginning, will escape into the atmosphere through a given aperture; for if it might possibly turn out, that this time was so great, as materially to interfere with the action of the engine, in this case any other advantages of the plan would be neutralized or overbalanced.

Mr. Henson has given no exact directions for the size of the aperture of escape. But assuming it to be in area about one-fourth larger than the usual size of steam pipes, taking the latter at one-fifth of the diameter of the cylinder, (and I see no reason why it may not be made yet larger) I find by calculation, that the necessary escape need not occupy more than one-tenth of the time of the stroke, which is time of the least value, since the crank is then very near the centres. If we suppose the aperture of escape to be duly proportioned to the pressure of the steam used, we shall certainly be doing no favour to the invention, if we calculate that one-tenth of the time of the stroke, or, what is the same thing, that the time occupied by the passage of the crank over 18 degrees, is the time employed in the discharge. Taking into account that the crank is then in a position in which the pressure on it really does very little in the rotary direction, and that the pressure of the steam is not withdrawn all at once, it will be seen that the power lost is very trifling; it is much under a fiftieth part of the power of the engine, and in many cases will not amount to half that quantity.

To consider next the comparative advantage. It should first be remarked, that the essence of the plan is, the getting rid of a quantity of steam by suffering it to escape into the atmosphere, instead of condensing it. Now it is obvious, that as the power by which it escapes is its excess of pressure above that of the atmosphere, there can be but little escape, and consequently little advantage, where low pressure steam is used: and as condensation is always employed in low pressure engines as well as in the improved engine, no advantage worth mentioning would follow the adoption of Mr. Henson's plan in steam engines of that class.

The case, however, is very different in respect of high-pressure engines working at full pressure. To their power it would add almost an entire atmosphere. It must, however, be remarked, that few existing engines are prepared, by the strength of their parts, to receive and transmit this additional power; but in many cases an equivalent advantage may be gained, by working the engine to its present power, with a smaller consumption of fuel. Suppose it were desired to work a non-condensing engine with an 18-inch cylinder, to the power of 40 horses, the steam must be 50 lbs. per square inch above atmospheric pressure. But by the adoption of this improved plan the same power would be produced by steam of 30 lbs. per inch on the safety valve. The expenditure of fuel in the former case would be 453 lbs. per hour, and in the latter 312 lbs.; being a saving of 141 lbs. per hour, which at 20*s*. per ton for 12 hours per day, and 300 working days in the year, amounts to 226*l*. per annum. From this, however, is to be deducted the expense of water for condensation, where it cannot be had without payment. Such an engine would require about 30,000 gallons of water per day.

A high-pressure engine, *worked expansively*, would be more economical in fuel than this improved engine. The engine now described would work to 40 horse power, if the steam were of about 78¼ lbs. per square inch total pressure (or 65¼ lbs. on the safety valve), and were cut off at half the stroke. Its consumption of coals would be about 270 lbs. per hour instead of 312 lbs., effecting a saving of a little more than one-eighth. The strain on the boiler would obviously be very great.

It is easy to see, however, that this kind of comparison may be carried to any extent, and made to present almost any desired results, by altering the suppositions as to the pressure and expansion under which the steam is worked.

It is however of consequence to observe, that on some occasions an economical use of steam may be effected, by combining the expansive principle with the escape of the extra steam; and by this means also the great inequality of pressure which forms an important objection in many cases to the use of expansive steam may be brought within tolerable limits, while to some extent its advantages are obtained.

If the improved engine with an 18 inch cylinder, be compared with a condensing engine of the same power, the advantage will be found to be considerable. One of forty horses' power, moving 200 feet per minute, will have its cylinder of 30¼ inches diameter: its consumption of water will be nearly 80,000 gallons per day, and of coal 400 lbs. per hour. The difference amounts to 50,000 gallons of water per day, which in many situations will be of very great importance, and 88 lbs. of coal per hour, which, at the rate above-mentioned, is equivalent to 141*l*. per annum.

As compared with both the expansion engine with condenser and the low-pressure engine, there is yet another saving of fuel to be effected by this invention. In those engines the heat of the steam which has done its work, is so combined with the water employed in condensation, that it can be recovered and used again to but a very small extent; perhaps one-thirtieth of the fuel may be saved in this way by supplying the boiler with heated condensation water. In the improved engine the method may be adopted, which is already in use with good effect in some high-pressure engines, of conveying away the discharged steam by a pipe which passes through the reservoir of water by which the boiler is fed. I suppose an eighth or a tenth of the fuel will be economised by this method.

These calculations will serve to show by example, the nature, and something of the extent of the advantages to be derived from this invention. It is clear that it is not applicable to low-pressure engines; and where the nature of the work to be done admits the unequal pressure produced by the extensive use of expansion, this engine will not be preferred; but in the numerous cases where regularity of action is indispensable, and in very many others where the supply of water is scanty, this contrivance, I think, will be of great value. Nor does it need scantiness of water to furnish a reason for preferring it, since its consumption of coals is considerably less than that of a condensing engine of the same power.

I conceive that a judicious combination of this invention with others of recent origin, would render a material service to steam navigation. It seems to me probable, that in the large transatlantic steamers a saving of weight in fuel and machinery might be thus effected to the amount of 150 or 200 tons. The great importance of such a result, not only to the current cost and returns of steam vessels generally, but to the practicable length of steam voyages, needs no remark.

SMOKE BURNING.

Sir,—Permit me to direct your attention to the accompanying paper by Mr. Robert Armstrong, on "Smoke Burning," as it appeared in the *Mining Journal* of the 8th instant, and to request its insertion, as it appears well entitled to the publicity which your columns will give it, on account of the great ingenuity it exhibits, and, as I propose, hereafter, making some observations on the new light it throws on an extremely difficult branch of the chemistry of combustion as applied to practice.

I am, yours, &c.

C. W. Williams.

Liverpool, January 11, 1842.

Sir,—Fully agreeing with a remark lately made by an able lecturer (Mr. Davies) at

the Athenæum, Manchester, that there is no locality in the world where a knowledge of chemical laws is of so much practical advantage as in this metropolis of manufactures, it was with peculiar pleasure that I lately heard of a most interesting application of those laws, in a newly-discovered process for burning smoke and economising fuel, by Mr. ——, by which those two important objects are effected in a manner far superior to any thing of the kind that has ever been seen before. The particular chemical laws thus applied are those relating to the diffusion of the gases, and other elastic fluids, said to be first discovered by Dr. Priestley; but the scientific principles of which were certainly first described by Dr. Dalton, in a paper read before the Manchester Philosophical Society, in October, 1803, and applied by him to the explanation of various atmospherical phenomena, as is well known.

The principal feature of Mr. ——'s plan is the compelling all or most of the carburetted hydrogen, and other combustible gases, which escape inflammation when first generated from the coal in the furnace, to return again and pass through the fire, where they are converted into flame under the boiler. The process is effected by placing a small rotary fan in connexion with that part of the flue through which the smoke is passing off to the chimney after having left the boiler. The fan being made to revolve with considerable velocity, exhausts the smoke from the smoke flue, and at the same time propels it through an additional return flue, leading to an enclosed ash-pit, from whence it is, by the joint exhausting and propelling action of the fan, forced to pass through the fire-grate, where complete combustion is effected, and the products of this second combustion again pass under and around the boiler as before, and hence up the chimney, in the state of vapour, carbonic acid gas, and azote, which are perfectly colourless.

Your chemical readers will be well aware, that this circulatory process, which, for want of a better word, I call double combustion of the fuel, cannot go on without a continual supply of atmospheric air, which is admitted at a small aperture, situated between the fan and the place where the latter communicates with the smoke flue; and it is in the particular adaptation of this aperture, with respect to the fan and to the chimney, that the peculiar philosophical principle which distinguishes this invention is brought to bear with so much effect.

It was demonstrated by Dr. Dalton, in the paper before referred to, that different gases act as vacua to each other, and it has recently been shown by Professor Graham, that the different gases have a tendency to diffuse into each other, with different degrees of rapidity, which bears a certain relation to their specific gravity; and hence it shows that, by availing ourselves of this tendency in mixed gases, a sort of mechanical separation of the various gases may be effected. Now, it is precisely this separation that is effected by Mr. ——'s process—the unconsumed carburetted hydrogen and carbonic oxide are returned under the fire-grate, mixed with a fresh supply of oxygen; while, at the same time, nearly the whole of the nitrogen and heavy carbonic acid gases are allowed to pass off below to the chimney.

From a consideration of this theory, the intelligent manufacturer will perceive, that, so far as the saving of fuel is derived from the burning of the smoke, it is not to effect that purpose alone that the fan or blower is required—the latter has a much more important duty to perform than that of merely forcing the smoke through the fire, and that is, the blowing of the fire. The effect of a strong draught generally, is not to burn the smoke, as usually understood, but rather to create such an intense heat, that a more complete combustion of the fuel is effected, and consequently, less smoke is produced.

Leaving out of view, for the present, the much disputed point, as to the absolute amount of heat that it is possible to save by burning the whole of the smoke in any case (although all who have seen Mr. ——'s plan in operation, at his own works, are compelled to acknowledge that it entirely burns the whole of the smoke—therefore, that saving is effected, whatever its amount may be); it may be stated, that, in regard to returning the smoke to the ash-pit, which is an essential point in this invention, it does not appear that the use of the fan is absolutely indispensable; for the lighter gases, which constitute the most valuable part of the smoke, have, according to Dr. Dalton's law of the "Diffusion of the Gases," before referred to, a natural tendency to leave the carbonic acid gas, and rush into the ash-pit as they would into a vacuum, at the same time, from their buoyancy, carrying the light carbonaceous matters with them; but the atmospheric air, which is essential to supply oxygen to support the combustion of those gases, not having this diffusive tendency to so great an extent, requires to be supplied by artificial means, and for that purpose a very small fan is necessary. The whole of the atmospheric air that is found sufficient to supply oxygen to the furnace of a twenty-seven-horse boiler is admitted to the fan through an aperture of only 10 inches by 4, and certainly does not require more than a quarter of a horse power to propel it; because the smoke which passes through at

the same time, both from its levity and the natural tendency to diffusion, before-mentioned, rather assists the propulsion of the fan than otherwise. By running the fan at a sufficient speed, of course any degree of draught can be obtained that may be thought necessary, even to the burning of the anthracite, or stone coal, or any common coal of inferior quality. Indeed, a considerable speed is necessary; for, as Sir Humphrey Davy long ago proved (and on which the theory of his safety lamp is founded), carburetted hydrogen, or coal gas, is the least combustible of any of the inflammable gases, and consequently requires a strong draught to effect its complete combustion. And here the question will no doubt occur to many, as to what is the probable effect of this necessarily strong draught, or "blast," against the boiler bottom. This is an important question; but it fortunately admits of being easily answered by any chemist who duly considers the *rationale* of the process, as given above; and the practical man, who will take nothing but facts, will find, upon inspection, that boilers have been working some months on this plan, with fires constantly under them, apparently capable of giving a welding heat to iron, without sustaining the slightest injury; and, moreover, he will find, that the underside of the grate-bars, upon which such intense combustion has been going on, is never found at a higher temperature than the metal of the burner of an ordinary gas light.

The ash-pit is, under the circumstances, converted into a reservoir of mixed combustible gases and common air, in such proportions as enables the latter to yield sufficient oxygen for combining with the former in the production of carbonic acid and water (or rather steam), and thereby eliciting the maximum quantity of heat from a given quantity of fuel, besides sufficient oxygen to support the less perfect combustion of the raw coal, when first thrown upon the fire-grate. Moreover, as these changes and combinations are being continually and rapidly effected, and although they are only the well known phenomena of ordinary combustion, yet they are, in this case, carried on in an atmosphere (so to speak) surcharged with a certain proportion of nitrogen and steam, which, being neither supporters nor combustibles, but being propelled by the fan in uniform mixture with other elastic fluids that possess these properties in an eminent degree, there can be no doubt that, in this process of double combustion, those two incombustible substances effect the very important purpose of diluting and modifying the oxidating property of the "blast." In fact, the peculiar mixture of elastic fluids thus effected, produces what is, I believe, called by some mineralogists, and others conversant with the use of the blowpipe, the "deoxidising flame." At any rate, a similar result is characteristic of Mr. ——'s process, in contradistinction to the ordinary process of blowing the fire with crude air; which latter method, whenever resorted to, has always effected the rapid oxidation of the grate bars, and the destruction of the furnace; but, according to Mr. ——'s plan, where the smoke itself is actually made in part the medium for blowing the fire, the draught produces a totally different result; while the manner of effecting it is as complete and simple as it is unique in its application to steam-engine furnaces.

In conclusion, allow me to observe, that, in the above attempt to illustrate what I conceive to be one of the greatest discoveries of modern times, I am in no way anxious to be considered as giving the only true explanation of the scientific principles concerned in it. My intention has been principally to state facts for the consideration of the more experienced chemist; and if, in attempting to theorise upon the subject, I have overstepped the legitimate province of the practical experimentalist, I have to plead, that I have been urgently requested so to do by several manufacturers, whose interests are likely to be most extensively affected by the invention; and I may add, that the subject is not the less interesting, as it affects the health and comfort of the population of all large towns.

R. Armstrong, C.E., Manchester.

MR. MALLET'S PROCESSES FOR THE PROTECTION OF IRON FROM OXIDATION AND CORROSION, AND FOR THE PREVENTION OF THE FOULING OF SHIPS.

The discovery of an effectual means of protecting iron, copper, and other metallic surfaces, from the injurious effects of exposure to atmospheric and aqueous influences, had long been an object of earnest, but nearly unavailing pursuit, as well among men of science as among mere practicians, when the successful application of iron to the building of ships gave suddenly a new impetus and great increase of importance to the inquiry. Sir Humphrey Davy had found out how to save copper sheathing from corrosion, by means of zinc protectors; but subsequent experience showed that, in proportion as the copper was thus

electro-chemically preserved, it was rendered more liable to be *fouled* by the adhesion of animal and vegetable substances—an evil scarcely inferior in magnitude to that of the destruction of the copper itself; and farther than the point so reached by Davy, science had not advanced, when the first iron ship was launched into the deep. Much was at one time said of certain patented processes of zincing, by which it was alleged iron could be so thoroughly coated, as not to leave a speck unexposed for air or water to act upon—and much was hoped from them; but one after another they all proved decided failures. In the best zinced sheets of iron produced by these processes, there were always found a number of spots which had been left bare, by the collection of rust on which, the protective power of the zinc, in respect to the remainder of the iron, was almost entirely neutralized. Of "anti-corrosive" and "anti-barnacle" paints and varnishes there had been also an abundance, both before and since the days of Davy, but not one which could be said to have survived the test of practice, or which was not, more or less, of an empirical character.

So matters stood—that is to say, about the time of iron first coming into extensive use for the construction of ships—when the British Association were induced to take up the question, as one of the most practically important of the day, and to devote a portion of their funds to the institution of a series of experiments in relation to it, under the direction of Mr. Robert Mallet, of Dublin, a gentleman eminently fitted, by practical habits and experience, as well as by scientific knowledge, to do justice to the task intrusted to him. The details and results of these experiments are related in two reports made by Mr. Mallet to the Association, and published in their Transactions: and though they go little farther than to show the defects of existing processes, (that of zincing more particularly,) they must be allowed to have accomplished a most valuable service, in having cleared the subject from the vast mass of false science and erroneous practice by which it had become encumbered.

Mr. Mallet, following out the course of investigation thus auspiciously commenced, has since happily mastered all the difficulties of the case, and devised a series of remedial processes with so much of science, and therefore of sufficient reason in them, as to leave no doubt on our minds of their perfect efficiency. To indicate briefly Mr. Mallet's discoveries, they may be said to consist, *first*, in a method of zincing iron so perfectly, that not a spot of the iron is, or can be, left unprotected; *second*, in a method of protecting iron and other metals by means of palladium, (at a moderate cost,) which renders them as incorrodible by air and moisture as palladium itself (*palladiumizing*, it may be called, with as much propriety as we say, *zincing*, or *gilding*, or *soldering*;) and, *third*, in a new paint, to which, from its life-destroying properties, Mr. Mallet has given the name of *zoofagous* paint, by the application of which to vessels, whether of wood or iron, or with whatever material they may be sheathed, *fouling* is rendered impossible. The following details of these processes, which we have great pleasure in being the first to lay before the public, we extract from Mr. Mallet's specification, which has been just enrolled.*

1. *The Zincing Process.*

Supposing the articles about to be zinced, are plates and ribs of iron, intended to be employed in the construction of an iron vessel, they are first carefully cleaned from all adhering oxide. With this view they are immersed edgewise in a suitable vessel of wood, pottery, stone or lead, containing dilute sulphuric acid of the specific gravity of about 1·300 at 60° of temperature, or dilute hydrochloric acid of the specific gravity of about 1·060 at 60° of temperature, formed by diluting these acids respectively as they are usually found in commerce with rather more than an equal bulk of water. As it is of importance that the scales of oxide should be detached as rapidly as possible, the diluted acid should be warmed; and this may be conveniently effected by means of a steam jacket round the vessel, or by blowing steam into the acid; the acid vessel, or "Cleansing Bath," as it may be termed, should be so constructed for operations on a great scale, that the lower portion of the acid, and the scales which are precipitated, can be occasionally withdrawn to prevent waste of acid, or the cleansing process from being inconveniently protracted. The iron must be wholly, not partially immersed, and the bubbles of gas formed on its surface must be free to ascend in the fluid and escape. As

* Enrolment Office, January 7, 1842.

soon as the scales of oxide have become detached or loosened, the articles are to be removed from the "cleansing bath," thrown into or washed with cold water, and struck or hammered to shake off and detach the scales. In the case of flat boiler plates they may be advantageously passed backwards and forwards, through the machine known to boiler makers as "a mangle." The surfaces of the iron are then to be thoroughly scoured, by hand or by any suitable machinery, with sand or emery, or with pieces of grit stone, while exposed to a small running stream of water, until they appear quite clean and of a bright metallic lustre. The articles are now, before being allowed to dry, to be plunged into a "preparing bath," consisting of the following mixture: A saturated cold solution of chloride of zinc is made by dissolving zinc or its oxide in hydrochloric acid; to this is added an equal bulk of a saturated cold solution of sal ammoniac; and to the mixed solutions as much more sal ammoniac in the solid state is added, as they will dissolve. Or, these solutions may be made and mixed hot, and the solid sal ammoniac then added, but the addition of some cold water will then be requisite to dissolve the whole of the salts so formed. The bath may also be formed of sulphate of zinc and sulphate of ammonia, or acetate of zinc and acetate of ammonia, or of any other soluble salt of zinc and ammonia or salt of manganese and ammonia. The nitrates of zinc and ammonia are the least advantageous, and it is stated that none answer the purpose so well as the chloride of zinc and sal ammoniac first before directed to be used. No free acid should be present in these solutions. As soon as the surfaces of the immersed articles appear covered all over with minute bubbles of gas they are then in a fit state for combining with the metallic alloy with which they are next directed to be coated; but they may be allowed to remain in the preparing bath for any convenient length of time without injury or prejudice to the subsequent processes. The metallic alloy last referred to is prepared in the following manner: A quantity of zinc is melted in a suitable vessel (one formed of pottery or stone is found to answer best), and when it is in a state of fusion, mercury or quicksilver is added, in the proportion of 202 parts of mercury to 1292 parts of zinc (both by weight) being in the proportion of one atom of mercury to forty atoms of zinc, both upon the hydrogen scale. The two metals are well stirred or mixed together with a rod of dry wood or of iron coated with clay; and when this has been done there is added one or the other of the metals known to chemists and others as potassium and sodium (the metallic bases, of which the well known alkalies potash and soda, are oxides) in the proportion of a pound or thereabouts of potassium or sodium to every ton weight of the alloy of zinc and mercury, or in some cases less will suffice; either potassium or sodium will answer the purpose, but Mr. Mallet prefers the latter, as more easily obtained and more manageable. Whether it is potassium or sodium which is used, it is removed from the naphtha, or other fluid in which it is customary to keep these metals, in order to preserve them from oxidation, in small portions of not more than half an ounce at a time, and by means of a small inverted cup of wood, formed on the end of a stick, thrust rapidly below the surface of the alloy of zinc and mercury, so as to avoid any waste or combustion of the alkaline metal. A triple alloy is thus formed of zinc, mercury, and sodium or potassium, which, having been again stirred and mixed with the rod of dry wood, or of iron coated with clay, is now ready for covering or coating the prepared iron. The combination of these metals is facilitated, and their oxidation on the surface retarded, by pouring upon their fluid surface some of the liquor of the preparing bath, or strewing upon it some of the salts dissolved in that liquor in a dry state.

The plates or ribs of iron are now to be taken up out of the preparing bath, permitted to drain for a few seconds, and while still wet with the liquor of the preparing bath, immersed in the triple alloy in a state of fusion. As soon as they have acquired the temperature of the bath of alloy, they are to be withdrawn from the metallic bath edgewise or endwise, when they will be found covered with a perfectly uniform and coherent coat or surface of the alloy. The affinity of this alloy for iron is, however, so intense, and the peculiar circumstances of surface as induced upon the iron presented to it by the preparing bath are such, that care is requisite lest by too long an immersion the plates are not partially or wholly dissolved. Indeed where the articles to be covered are small, or their parts minute, such as wire or nails or small chain, it is necessary before immersing them to permit the triple alloy to dissolve or combine with some wrought iron, in order that its affinity for iron may be partially satisfied and thus diminished. At the proper fusing temperature of this alloy, which is about 680° Fahr. it will dissolve a plate of wrought iron of an eighth of an inch thick in a few seconds. No sputtering is produced by the immersion of the iron wet from the preparing bath into the alloy; but care is to be taken that there are no hollow places or cavities in the articles immersed which the alloy cannot wholly fill; lest in such case steam may be generated below the surface of the metal, and a dangerous explosion be thereby occasioned. It is

stated to be desirable that the melting vessels should be as deep and expose as small a surface as the nature of the articles to be immersed will allow. At the moment of immersion of the articles, the surface of the alloy is to be cleansed of all dross or oxide by a wooden skimmer. As soon as the iron plates or ribs are withdrawn from the alloy or "Metallic Bath," they are to be plunged into cold water and well washed therein. The surface of the iron is now in a condition permanently to resist corrosion and oxidation in air, or in salt or fresh water.

All the foregoing operations are best performed upon the plates or ribs after they have been bent and fitted to their places, and the plates have been riveted together into large pieces of eight to ten feet square or more. When again put "into frame," or placed in their respective positions in the ship's hull, they are directed to be united by rivets countersunk from the outside, and consequently headed inside the vessel. The countersunk heads of these rivets are to be also coated with the triple alloy in the manner before described, and tongs of iron are to be provided, having a very large mass of metal in their jaws, between which a hollow seat, of the shape and size of the countersunk rivet head, is to be formed to receive it. An alloyed rivet being seized by a pair of such tongs may have its point heated to a riveting or welding heat without injuring the coat of alloy upon its countersunk head; for the heat is carried off from the latter so fast by the contact of the large mass of iron in the jaws of the tongs, which are to be cooled occasionally, as to prevent the head of the rivet becoming hot during the heating of the point in a common smith's fire.

The hull of the iron vessel, being thus completed, and wholly covered with the alloy, is then to receive a coat of varnish all over, of either of the compositions about to be described. If possible, this varnish should be laid on with a spatula or thin flexible blade of horn, or some such material, as a brush produces minute air bubbles, which leaves spaces uncovered on the drying of the varnish. The varnish will dry, or get hard and coherent, at ordinary temperatures; but when practicable, it is desirable to expose it for some hours to a temperature of about 300° Fahrenheit, which gives it greater adhesion and durability. The iron surfaces may be warmed in successive portions by heat radiated from "chauffers" or open fires of coke, or by any other convenient means. The varnish may be either of a composition, which Mr. Mallet terms No. 1, or of another, which he terms No. 2. The composition, No. 1, is formed as follows:—Take 50 lbs. of foreign asphaltum, melt and boil it in an iron vessel, for three or four hours; add gradually 16 lbs. of red lead and litharge ground together to a fine powder in equal proportions, with 10 imperial gallons of drying linseed oil, and bring all nearly to a boiling temperature. Melt in a separate vessel 8 lbs. of gum anime (which need not be of the clearest or best quality); add to it two imperial gallons of drying linseed oil, boiling, and 12 lbs. of caoutchouc softened, or partially dissolved by coal tar naphtha (as practised by the makers of water-proof cloths). Mix the whole together in the former vessel, and boil gently until, on taking some of the varnish between two spatulas, it is found tough and ropy. When this "body" is quite cold it may be thinned down, with from 30 to 35 gallons imperial of turpentine, or of coal naphtha, which will make it ready for use. Mr. Mallet states this to be the best varnish he is acquainted with for this purpose. It is not acted on when dry and hard, by any moderately diluted acid or caustic alkali; it does not by long immersion combine with water, and so form a white, and partially soluble hydrate, as all merely resinous varnishes and all oil paints do; it is, moreover, so elastic, that a plate covered with it may be bent for several times without its peeling off. And, lastly, it adheres so fast, that nothing but a sharp edged instrument will scratch it off the surface of iron. The composition No. 2 is of a cheaper sort, but not quite so good. Common coal or gas tar is to be boiled in an iron cauldron, at so high a temperature, that the smoke from it is of a yellow dun colour; or the tar is to be caused to flow through red-hot iron tubes. The boiling passage through the tubes is to be continued until the residue is a solid asphaltum, breaking with a pitchy fracture. It is essential that the boiling should be carried on at this high temperature, as the permanence of the varnish in water depends upon the tar having been submitted to the temperature at which naphthaline is formed, by the decomposition or breaking up of the original constitution of the tar. Take 56 lbs. of this coal tar asphaltum; melt it in an iron vessel: add 10 imperial gallons of drying linseed oil, ground with 25 lbs. of red lead and litharge, in equal proportions; add to the whole, when well mixed, and after boiling together for two or three hours, 15 lbs. of caoutchouc, softened or partially dissolved by coal naphtha, as before described; and when cold, mix with 20 to 30 gallons of turpentine, or coal naphtha, which will make the varnish ready for use.

2. *The Palladiumizing Process.*

The articles to be protected are to be first cleansed in the same way as in the case of zincing, namely, by means of the double

salts of zinc and ammonia, or of manganese and ammonia; and then to be thinly coated over with palladium, applied in the state of an amalgam with mercury.

[The directions given as to this process are meagre, in comparison to those supplied for the other processes; but we are informed that the protection afforded by the palladium is as absolute as that by the zincing, and by no means so costly as to exclude it from economical use.]

3. *The Zoofugous Paint.*

After the iron vessel has been zinced and varnished, in the manner before described, it is done all over (above the varnish, of course,) with a strong-bodied thick paint. This is composed of drying linseed-oil, red lead, and sulphate of barytes, (or white lead may be used, but not so advantageously,) and a little turpentine. To every 100 lbs. of these ingredients, when mixed, is to be added 20 lbs., or thereabouts, of oxychloride of copper, and 3 lbs. of a mixture composed of hard yellow soap melted with an equal weight of common rosin, and a little water. The colour originally sold in commerce under the name of "Brunswick green," was an oxychloride of copper; but the present Brunswick green of commerce is a different thing, and will not answer. The oxychloride of copper may be obtained at a cheap rate, by various known methods, which it is unnecessary to detail. When the whole of the hull of the vessel has been done over with the paint, it must be permitted to dry and harden for three or four days, before the ship is floated out of dock. The entire series of operations are now completed; and the hull of an iron ship so treated will, Mr. Mallet assures us, "resist all corrosion from the action of air, and fresh or sea-water, and not be liable to 'fouling,' by the adhesion of marine animals and plants."

Mr. Mallet adds, that the power of the zoofagous paint to prevent 'fouling' arises from the fact, that the insoluble, or difficultly soluble salts of copper, and of certain other metals, are so noxious to the life of marine or aquatic animals and plants, which generally attach themselves to ships' bottoms, that they will not adhere or grow upon a surface so treated. The paint, therefore, is only a vehicle for poisonous matter, for which purpose it is requisite that it should have sufficient adhesion to resist the ship's motion, but still should have a slight degree of solubility in water, so that the poisonous matter may be taken up by the absorbent or capillary vessels of any adhering animal or plant. This latter property is given it by the addition of the resinous soap, the proportion of which should be varied to suit the climate to which a ship is going, more being used in frigid, and less in tropical climates. Mr. Mallet prefers using the oxychloride of copper, and has found it by much the most efficacious; but any insoluble or difficultly soluble salt, of copper, mercury, arsenic, or antimony, or any combination of these, whether soluble or insoluble, may be substituted for it.

General Observations.

Although Mr. Mallet deems it *advisable* that where new ships are intended to be protected by zincing, the iron should go through the whole of the processes before directed, namely, the cleansing, the coating with the triple alloy, the varnishing, and the final coating with the zoofagous paint, he remarks that they are not all equally essential, and points out how the same effects may be produced, though attended with less favourable circumstances, by the adoption of a part only of these processes:

"For, supposing the plates and ribs of iron were merely coated with the triple alloy of zinc, mercury, and potassium or sodium, without the addition of the protective varnish and zoofagous paint, it is certain that, on the exposure of this alloy to the action of air and water, the positive metal at the surface would be first acted on, and the surface become shortly covered with a very thin coat of amalgamated zinc, which is known not to be acted upon by fluid menstrua, (except under peculiar conditions, which do not exist in the case here supposed,) and does not, as I have found by experiment, gather to itself, when exposed to sea or fresh water, any of that calcareous coating which is productive of the fouling of vessels. The advantage gained by varnishing over this triple alloy coating is of a twofold nature. In the first place, it serves as a mechanical protection to the coating, and thereby to increase its durability; and, secondly, it shields the alloy from contact with the zoofagous paint, some of the ingredients of which would exert an injurious chemical action on the alloy. The office, therefore, of the triple alloy is simply to prevent corrosion and oxidation, (including, where used by itself, that of preventing the formation of calcareous adhesions;) that of the varnish, to protect the triple alloy; and that of the zoofagous paint, to prevent fouling, by the destruction of any marine animals or aquatic plants which may seek to attach themselves to the protected surfaces."

When the addition of the zoofagous paint is not required, to prevent fouling, as in the case of articles exposed to the action

of the atmosphere only, Mr. Mallet states that any desirable colour may be given to the protecting varnish, by a mixture of colouring materials, but that care must be taken that these colouring materials consist of per-oxides not liable to be acted on by air or moisture. The best method to adopt, however, with such articles, is said to be, to pay the varnish all over with a coat of oil-paint.

Finally, although the triple alloy is directed in the first instance, to be employed at the fusing temperature, Mr. Mallet states that, by the addition of a larger portion of mercury, articles of cast or wrought iron or steel may be coated with that alloy at a lower temperature, and even in a cold state, by means of simple contact and friction.

BADCOCK'S AUTOMATON LUBRICATOR ANTICIPATED.

Dear Sir,—On perusing the *Mechanics' Magazine* for the past month, I read, at page 446, a description of an "Automaton Lubricator," by Mr. Badcock.

This Lubricator so closely resembles an instrument which was invented by me, for the purpose of readily supplying equal measures of mercury, for dividing the capacity of glass tubes into any required number of equal parts, that it only needs to be supplied, (as mine is,) with an adjusting screw to regulate the capacity of the cavity in the plug, to make it complete for its intention. You did me the honour to notice the instrument to which I have referred in the *Mechanics' Magazine*, dated May 1, 1841.

Believe me very faithfully yours,

CHARLES THORNTON COATHUPE.

Wraxhall, January 5, 1842.

HOOD ON HEAT, AND THE INSTITUTION OF CIVIL ENGINEERS.

Sir,—Observing in your last number a paper headed "Hood on Heat," commencing with the observation, that "The Members* of the Institution of Civil Engineers have given an extensive publicity, as well as a *sort* of *impticd sanction* to the contents of a paper lately read before that body," I beg permission to remind you, that every publication issued from that institution is accompanied by an announcement expressly disclaiming the *implied sanction* of which you speak. I quote the following from the last volume of the Transactions. "The Institution is not responsible for the opinions, statements of facts, or trains of reasoning contained in its publications; such responsibility rests entirely with the *authors* of the respective communications. Nor is publication in the Transactions of the Institution of the account of an executed work or invention, to be taken as an expression of opinion on the merits of such work or invention."

I am, Sir,

Your obedient servant,

C. E.

January 10, 1842.

* Error of the press, for "Minutes."—ED. M. M.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees wishing for more full abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

EDWARD HAMMOND BENTALL, OF HEYBRIDGE, ESSEX, IRON-FOUNDER, *for certain improvements in ploughs.* Petty Bag Office, December 10th, 1841.

These improvements consist, firstly, in the peculiar construction and mode of adapting an adjustable lever to the frame of the plough, for the purpose of changing the inclination of the share, which is attached to the end or nose of the lever, so that the point of the share may stand at any required angle below or above the level of the sole slade or ground of the plough.

Secondly, In the particular form of the shares, and modes of attaching them to such adjustable levers.

Thirdly, In the mode of affixing the breast or mould board to the plough, in order that it may rise and fall with the adjustable lever and share.

Fourthly, In the means of contracting or expanding the breasts of a double breast plough, when such double breast is cast or formed in one piece.

The first improvement is carried out in the following manner: a lever is placed at the front of the frame, having at its lower end a groove, in which a step on the sole of the plough works, allowing a small movement backward and forward; beyond this fulcrum the lever is fixed to the ploughframe by a loose bolt. At the top of the lever, on its front face, is a screw, which passes through the centre of a projecting piece or ear of the plough-frame, being secured in any required position by a nut on each side of the ear or projection. By shifting these nuts backward or forward, therefore, the position of the lever is varied, and any required degree of inclination obtained at pleasure.

Another arrangement is shown and described, differing from the former only in,

that instead of the groove in the lever working upon a step, the lever works upon a central bolt passed through the frame of the plough. The mode of attaching the share is also varied. The patentee observes, that "Having explained the manner by which I vary the position of the point of the share by an adjustable lever and screw, I would add, that should it be thought desirable to make this adjustment while the plough is in progress, it may be done by means of a horizontal screw shaft, extending from the front to the back of the plough, the forward end being passed through a swivel eye or socket at the top of the lever, the hinder end of the shaft being supported in a bearing fixed into the back part of the plough, and the shaft turned when required by a winch or other apparatus, within convenient reach of the ploughman."

[This arrangement formed the basis of certain improvements in ploughs, patented by Mr. Theophilus Smith, of Attleborough, in February 1841,* whose patent would, therefore, be infringed by such an extension of Mr. Bentall's contrivance.—Ed. M. M.]

As it is necessary that the breast should rise and fall with the varied position of the share, the front of the breast is attached to the lower end of the moveable lever by a pin or bolt; the back or hinder part being attached to the frame by means of a contrivance commonly called a way-pin or way-bar.

For the purpose of contracting or expanding the breast of a double-breasted plough, when such is cast or otherwise formed in one piece, two screw bolts are affixed, one on the inner side of each breast; these screws pass through the two ears or projections of a way-bar, which is bolted to the frame, and are each secured by nuts on each side of the ear. By moving these nuts backward or forward the two breasts are contracted or expanded and set at any required distance apart; the elasticity of the metal allowing (it is said) of sufficient play for this purpose.

The patentee recommends, as advantageous, the case-hardening of the inner front of each breast to afford increased durability.

Alexander Horatio Simpson, of New Palace-yard, Westminster, Gentleman, Peter Hunter Irving, and Thomas Eugene Irving, both of Charles-street, Hatton-garden, Philosophical Instrument Makers, *for an improved mode of producing light, and of manufacturing apparatus for the diffusion of light.* Enrolment Office, December 17, 1841.

The first of these improvements consists in the production of light, by means of ignited pyroligneous spirit, across which a jet of oxygen gas is driven, causing the flame to impinge upon a cylinder of lime, kept at a proper height by suitable apparatus, and either turned occasionally by hand, or kept in continual rotation by means of clock-work.

The second improvement consists in manufacturing reflectors for lamps of all kinds, in copper, and afterwards silvering them by the electrotype process. These reflectors may be afterwards polished, or employed in the unburnished state for the diffusion of a subdued light.

John George Truscott Campbell, of Lambeth-hill, Upper Thames-street, Grocer, *for improvements in propelling vessels.* Enrolment Office, December 18, 1841.

These improvements in propelling vessels consist in the application of curious levers or shanks with guides, or levers without guides, by means of springs and propellers to be used under water, and whose combined action are a series of inclined planes moving between two parallels, thereby producing a very powerful reciprocating undulatory motion "with the least resistance possible," it being only the thickness of the propeller. The only place where they can be worked with ease and useful effect is in a hole at the after part of a vessel, immediately before the stern post.

To distinguish this propeller from all others, and on account of its peculiar action, "being the nearest approach to nature, and consequently obtaining the greatest velocity," the patentee calls it the "Whale Tail, or Fluke Propeller," and states that the experimental boat, "Ærolite," which is 69 feet long, and 9 ft. 4 in. beam, is fitted with this propeller. Within a frame at the hinder part of the vessel, but in front of the stern-post, there is a horizontal shaft upon which two triangular shaped frames or levers are mounted; that in the starboard side is used for forward propelling, the larboard for backing astern. The upper and inner angle of the lever is joined to a connecting rod, attached to a main rod proceeding from the engine, and working through a stuffing box in the bulk head; at the opposite angle a horizontal propeller is joined to a knuckle, and as the engine draws the connecting rod to and fro, the propeller beats up and down, within the limits prescribed for its motion by the right angled form of the space in the lever in which it moves; when one propeller is in action, the other is held quiescent in a horizontal position, thus offering only the resistance due to its thickness.

George Thomas Day, of Upper Bel-

* For a description of Mr. Smith's invention, see vol. xxxv. p. 178.

GRAVE-PLACE, PIMLICO, GENT., *for an improved apparatus for creating draft, applicable to chimneys and other purposes.* Enrolment Office, Dec. 23, 1841.

This apparatus consists of a vertical cylinder, in the centre of which a spindle is mounted, carrying the thread of an archimedean screw. A rapid motion being given to this spindle by a suitable arrangement of wheel-work, a strong upward current of air is produced within the cylinder, which may be applied for increasing the draft of chimneys, or for ventilating apartments, &c.

WILLIAM LOSH, OF LITTLE BENTON, NORTHUMBERLAND, ESQ., *for improvements in the manufacture of railway wheels.* Enrolment Office, Dec. 24, 1841.

These improvements, relate to the application of wood, felt, rope, or other such like flexible or yielding material between the inner tyre and the ring or felloe, or bearings produced by the prolongations of the bars of iron employed to make the wrought iron spokes, with or without the intervention of a ring of malleable iron between such bearings and such flexible or yielding material; by which means wrought iron railway wheels will be less liable to be prejudicially acted on by the vibrating to which such wheels are liable when in use, than if they were composed of iron alone.

The sort of wheel to which these improvements are said to be applicable, are those included in the patentee's former patent of August 1830.

[The introduction of wood or fibrous materials intermediately between the spokes and the tyre, is included in the previous patent of Mr. Edmund Tayler, of which we gave an abstract at page 413 of our last volume.—ED. M. M.]

MOSES POOLE, OF LINCOLN'S-INN, GENTLEMAN, *for improvements in producing and applying heat.* (A communication.)—Enrolment office, Dec. 24, 1841.

The invention which forms the subject matter of this patent, is the mode of producing and applying heat discovered by Mr. Faber, director of the Royal Mines at Wasseralfingen, in Wirtemberg, referred to in the communication of C. Detmold, Esq., C.E. to our esteemed correspondent, C. W. Williams, Esq., and published at page 5 of our present volume.

In the specification, these improvements are described as consisting: firstly, in a new mode of heating furnaces used in the different manufactures, by employing carbonic oxide gas as fuel, instead of coal, coke, peat or wood. In the manufacture of iron and other metallurgic operations where blast furnaces are used, this carbonic oxide gas is obtained in a pure and uninflamed state; from the blast furnace it is taken some distance below the mouth and conveyed by means of a suitable apparatus to any other furnace that requires to be heated. Secondly, In a new mode of heating furnaces by means of carbonic oxide gas, which may be obtained from a separate furnace expressly constructed for that purpose. Thirdly, in a mode of applying the blow-pipe to furnaces, whereby the withdrawal of the carbonic oxide gas in the working furnaces is facilitated, and the combustion in the furnaces or boilers, assisted by the mixture of heated air with the carbonic oxide gas, thus producing a most intense heat.

This invention is stated to be applicable to the furnaces used in the different processes for the manufacture of iron, and the treatment of other minerals generally, as well as to ovens or furnaces requiring a high temperature, such as glass or pottery furnaces, gas-works, breweries, for evaporating fluids, and to the purpose of generating steam. Its application to the manufacture of iron is minutely detailed, and illustrated with numerous drawings of the furnaces, apparatus, &c., employed.

WILLOUGHBY METHLEY AND THOMAS CHARLES METHLEY, of FRITH-STREET, SOHO, IRONMONGERS, *for improvements in machinery for raising, lowering, and moving bodies or weights.* (A communication.) Enrolment Office, Dec. 24, 1841.

These improvements are first shown as applied to the weighing of anchors, &c. by an apparatus proposed to be employed in lieu of an ordinary capstan. In the centre of a strong iron frame, there is a vertical shaft or spindle, having at its lower end a small toothed wheel or pinion, and fitted at its upper end with an ordinary capstan head; two grooved barrels are also placed vertically within the frame, one on either side of the central shaft or spindle: at the bottom of each barrel there is a large cog wheel into which the central wheel or pinion works. The lower grooves of the barrels, where the rope is first received are rounded, but they gradually sharpen as they approach the upper part of the barrel. On the under surface of one of the barrels a ratchet wheel is fixed, into which a series of palls take, in the usual manner, for holding on. On the right hand side of the frame there are two guide pulleys for guiding the slack of the rope, which on turning the capstan head will work without fleeting or surging. A second modification of this invention is shown as applied to a windlass, in which two barrels are placed horizontally one before the other; a portion of their circumference being furnished with a number of grooves, by means of which ropes or cables may (it is said) be worked without surging or fleeting, by means of windlass levers, or other suitable machinery.

SMOKE NUISANCE MEETING AT LEEDS.

A numerous and highly influential meeting took place at the Music Hall, at the instance of Edwin Eddison, Esq., of Leeds, on Wednesday last, for the purpose of examining and discussing the various inventions for preventing smoke. Sir W. Beckett, Bart., M.P., took tha chair at 12 o'clock, and having, in a very suitable address, explained the objects of the meeting over which he had the honour of presiding, he trusted that the effect of the day's proceedings would be to lead, practically, to an abatement of tha great nuisance of smoke which hung over their town, and was so injurious to tha health of its inhabitants. The chairman then called on the several patentees, who were present, to explain their respective inventions.

Among those whose patents were explained were, Mr. Thomas Hall, Mr. Williams, Mr. Chanter, Mr. Iveson, Mr. Rodda, Mr. Drew.

Mr. Draper, for Mr. Thomas Hall, explained, chemically, the nature of combustion, and the necessarily large quantity of air which was required for the combustion of the 10,000 cubic feet of gas which was generated from every ton of coals, and explained how his plan would provide for such an adequate supply; contending that the charge against it, of not providing a sufficiency, was erroneous.

Mr. C. W. Williams said, he would not enter into the chemical details of the question, but satisfied himself by speaking to the prevention of Smoke. He then combated, at some length, the idea that smoke could ba consumed in a furnace. In explaining his mode of effecting the combustion of tha gaseous part of coal, from which smoke was generated, he referred to the difference between the perfect combustion of the gas from the numerous minute apertures of an argand gas-burner, as compared with that from the same quantity of gas when the burner was unscrewed, and the gas allowed to escape from the tube above. Ha contended that this difference explained the whole question of the prevention of smoke, and the principle on which nature proceeds in the combustion of the gas. The bringing a full supply of air to the gas was not sufficient, as Mr. Hall had stated. So intimate an incorporation of the atoms of gas and air must be effected, that those which were respectively to combine, and to effect combustion, must be brought together and into contact, not in masses, but in atoms.

Mr. Rodda read from a paper a description of his furnace, by which air was admitted by side apertures.—(See *Mech. Mag.* No. 837.)

Mr. Chanter explained, at considerable length, his invention, and referred to a numerous list of testimonials. He stated that he had six patents, and the last ha seemed to prefer to any of the former.

Mr. Bell, for Mr. Iveson, then read a statement of his invention of injecting steam into the furnace.

Several other patents were explained by the patentees or their agents, and with reference to models and drawings.

After all the patentees had gone through their explanations, a number of questions were put with reference to the length of time the inventions had been in use, the kind of coal used, the saving of fuel, &c., and an animated discussion ensued, of a highly interesting character.

Tha meeting lasted four hours, when a series of resolutions were adopted. The first was declaratory of the conviction of the meeting that the combustion of smoke could be completely effected, and so as to abate the great nuisance complained of. This resolution did not pass unanimously, as several gentlemen objected to the term "Combustion of smoke," on the ground that it was contrary to the opinion of the best chemical authorities, and that though the nuisance might be much abated, it was too much to speak so decidedly.

The second and most important resolution was for the appointment of a numerous and highly influential committee to receive communications and carry out the great object of the meeting.

Resolutions were also passed that a subscription be entered into in furtherance of the above object.

A highly complimentary and well-worded

resolution of thanks was then voted to Mr. Eddison for the expense and trouble he had put himself to, and the exertions he had made in originating and organizing the meeting; the whole meeting, at the instance of the Chairman, standing up and expressing unanimously their concurrence with the resolution.

Written communications were then read from Mr. Samuel Hall, Mr. Charles Hood (with a copy of his paper on the combustion of coal), Mr. Josiah Parkes and several other parties.

The room contained many beautiful models, drawings, &c. of the inventions exhibited; and the whole affair went off with much spirit.

NOTES AND NOTICES.

Gonon's Improved Telegraph.—M. Gonon's telegraph is an improvement upon that now employed in France, and which, through all the mutations and revolutions of the French people, has been in constant use in that country for 48 years. M. Gonon, after reaching the height of Mr. Chappe's system, was led to believe that further means could be employed, and that he could correspond, word for word, without using more signals than words, which ample experiments, since had, have proved beyond the possibility of doubt. In view of these experiments, he is led to assert that, with 30 observations between Washington and New York, he could transmit from the latter to the former city the words—"The British fleet, three ships of the line and five frigates, appeared off the Hook at 32 minutes past 10," in five or six minutes.—*Baltimore American.*

Electrical Clocks.—In front of the Royal Polytechnic Institution there is a clock of large size, going by the action of voltaic electricity, the dial plate of which is illuminated at night for the convenience of the public. We believe this is the first street clock of the kind ever established, and its erection may be therefore looked upon as something both good and new in the world of science. For the purpose of keeping correct time simultaneously in a multitude of such clocks, the inventor proposes to fix a "regulator" in a central position, which is there to receive from a galvanic battery a continuous stream of electricity to be dispersed by itself, through the agency of an electro-magnet, to any number of time-pieces with which it might be placed in electrical communication, all of which would consequently keep time with one another, and with the controlling regulator. The Polytechnic clock has been going ever since Christmas-eve; and Mr. Bain, the inventor of the electrical clocks, avers that it will never require attention as long as the "regulator" is kept in motion, and the galvanic battery is supplied with its necessary elements.

Magnetic Disturbances.—Similar disturbances to those observed and recorded by the Astronomer Royal, at Greenwich on the 25th of September, and noticed in our last number, are stated by a correspondent of the "Times" (J. F. W. H.) to have been also observed, at the same time, at the Magnetical Observatories at Toronto, in Canada, at Longwood, in St. Helena, at the Cape of Good Hope, and at Trevandrum at the observatory established by his Highness the Rajah of Travancore. At all these stations, differing so widely in geographical position as to embrace nearly a hemisphere of the globe, the disturbance was of such extraordinary amount as to cause the immediate institution of extra observations. The disturbances continued during the 24th and 25th of September, and their phases, allowing for the difference of longitude, were simultaneous at all the stations.* Returns have not yet been received from other stations, but are early expected from many, such as from Simlar in the Himalaya, from Van Diemen's-land, and from the Antarctic expedition under the command of Captain Ross, &c. The writer adds, "Independent of the great changes in the direction of the needle, the total intensity of the magnetic power of the earth appears to have undergone, at all these stations, and at the same instant of time, fluctuations which may well be regarded as astonishing. The whole magnetic system of our planet seems to have been during those two days, so to speak, in a state of convulsion. Philosophy will of course be busy in speculating on the origin of phenomena so surprising, but we must not forget a tribute of praise to the zeal and diligence of the officers charged with the direction of these observations, and who have followed them up so efficiently, nor to the liberality of the British nation in working out on so magnificent a scale the recommendations of scientific men, in this, by far the greatest combined scientific operation the world has yet seen undertaken." For "J. F. W. H." we fancy there can hardly be any mistake in reading "Sir J. F. W. Herschell."

Water Shoes.—A Lieutenant Hookenberg, of Denmark, has invented an apparatus, by means of which persons may traverse the water. It is described, (not very clearly,) as "resembling two very narrow boats, pointed at both ends, and united by a square piece of wood, about 30 inches long." The following account of a recent exhibition of it, before the Royal Family of Denmark, is given in the *United Service Journal.* "The arm of the sea which runs into the Thier Garter was the spot selected for the evolutions. The water-runners went through a variety of movements, among which were their loading and discharging their muskets while upon the water, running along on its surface at full speed," &c. The shoes, it is added, are so easy, that any person of moderate dexterity and quickness may be taught to manage them.

Bude Light.—On Monday evening last a Bude light was tried for the first time, as street illumination, at the extended crossing in Pall-mall at the end of Waterloo-place, Regent-street, and facing the Duke of York's Column. It very powerfully illumined the whole of the extensive space constituting the end of Regent-street and the opening at Pall-mall, and in front of the Athenæum Club-house, making the gas lamps along the pavements look as diminished as do the oil lamps at the end of Gower-street and in other parts of St. Pancras, where contrasted with gas-lamps.—*Times.*

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PALMER AND PERKINS'S PATENT PUMPS.

Fig. 3.

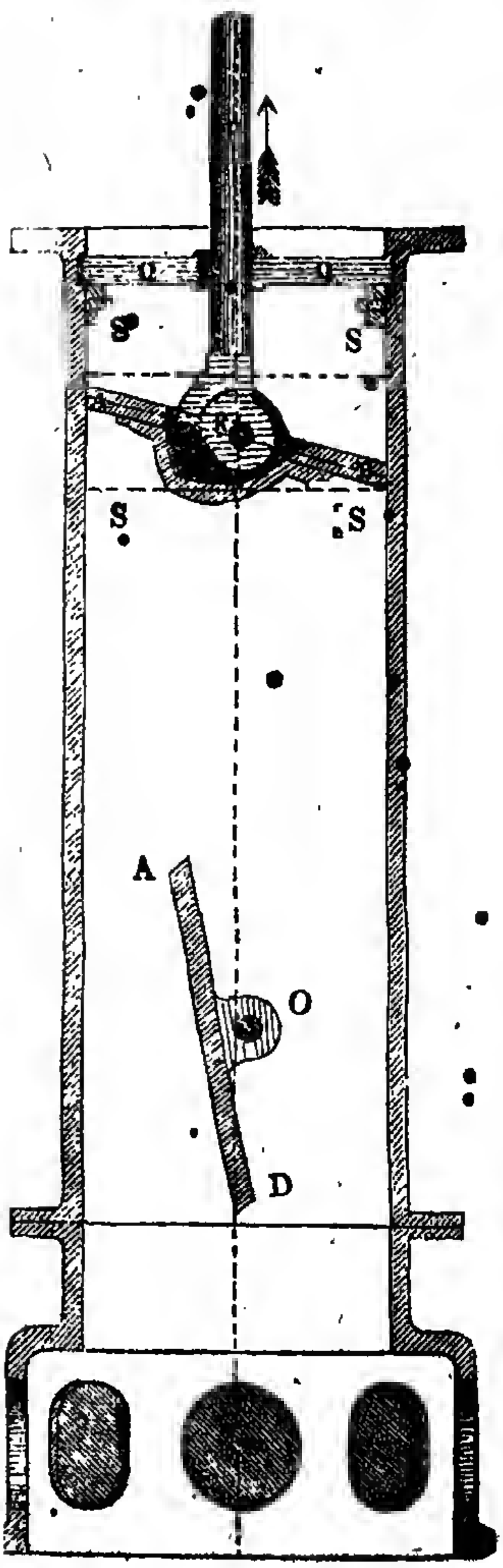


Fig. 1.

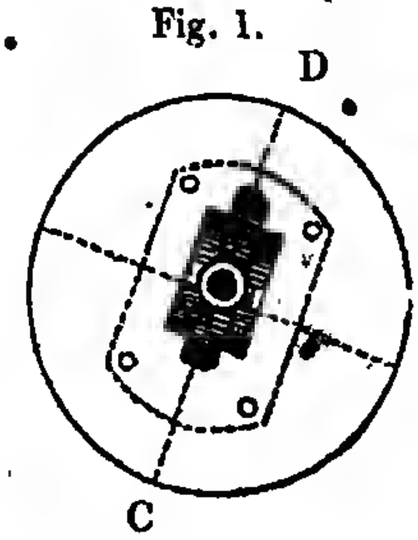


Fig. 2.

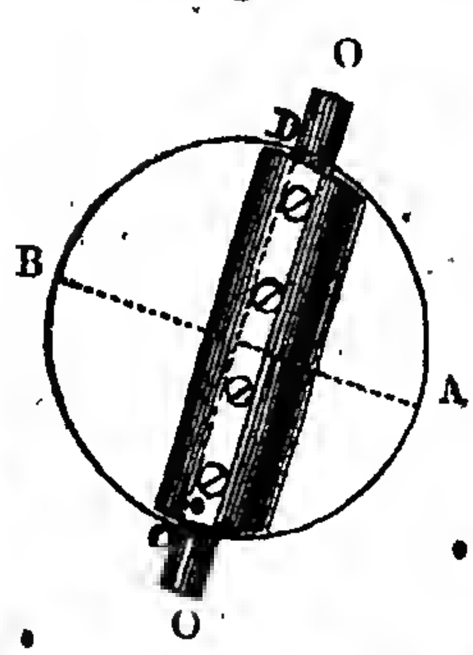
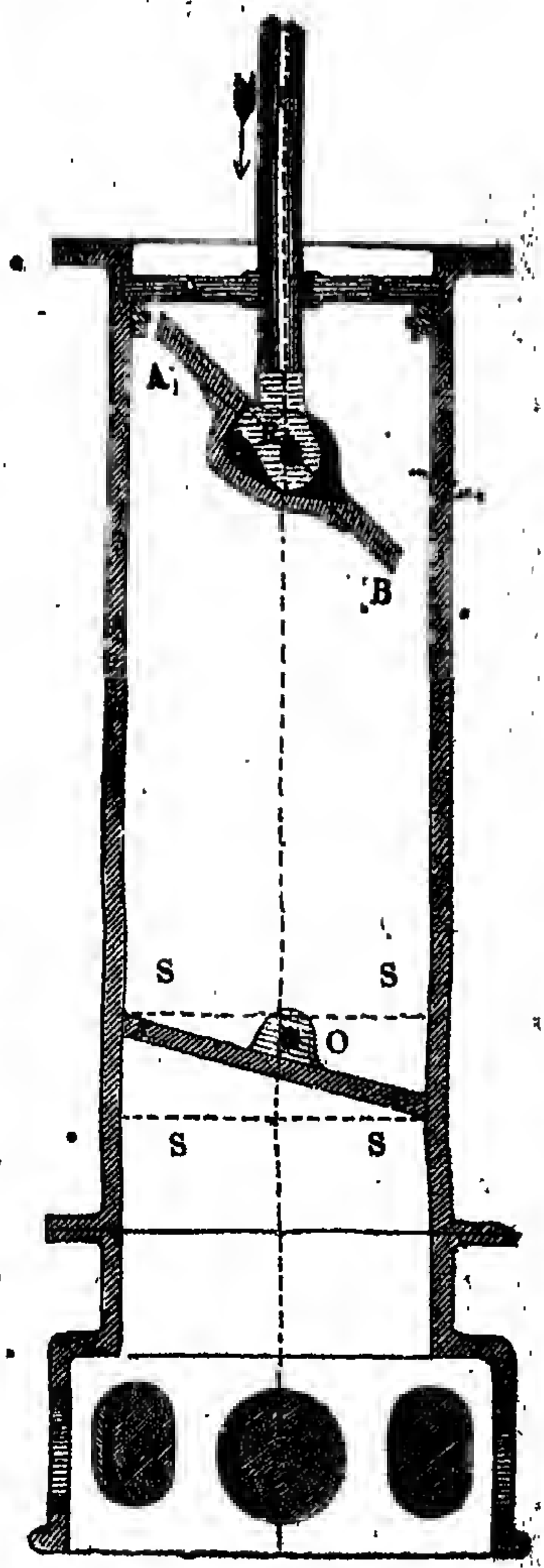


Fig. 4.



MESSRS. G. H. PALMER AND CHARLES PERKINS'S IMPROVED PISTONS AND VALVES FOR RETAINING OR DISCHARGING LIQUIDS, GASES AND STEAM.

The present improvements are brought before the public by the patentees, with an expectation that they have succeeded in making one of the most important articles of use, in the simplest form and of the most durable construction. Every one is aware in how many ways the pump is conducive to human operations, as well as the many casualties to which it is subjected by the manner in which, and the materials of which, it has hitherto been made. The action of a pump is derived from one or more valves opening upwards in the lower or fixed bucket (commonly called the clack), and from one or more valves also opening upwards in the upper or moveable bucket. These valves are either made of leather, or their motion (when not so made) is insured by hinges, or connexions usually made of the same material. The upper, or moveable bucket, moreover, in order to produce a vacuum beneath it in its ascent, is packed or fitted to the sides of the working barrel of the pump, either with leather or hemp—materials which are liable to be affected by differences of temperature in different climates, subject to the attacks of incrustation, to the operation of many wasting influences, and above all, to a rapid deterioration either from use or disuse. The moment these perishable adjuncts to the operation of a pump are out of order, the machine itself becomes useless.

Impressed with these facts, and having themselves suffered from their costly disappointments, the patentees, after many fruitless endeavours, hit upon the expedient of producing the desired action in a pump barrel by the substitution of two simple elliptical metallic discs for the complex and perishable packed and valved buckets previously in use; when (the natural consequence of every simple contrivance for a specific purpose,) they found all the evils of the old mode removed, and many advantages derived which were not before considered as obtainable.

To explain this invention more precisely: The pump barrel is fitted with two metallic discs, the lower one a fixture, the upper one connected to, and moving with the pump rod. These discs or pistons, are made elliptical, by being cut diagonally out of a solid cylinder of the same diameter as the pump barrel. They lie inclined in the barrel, and although in that position, they fit the circle of the barrel with the greatest accuracy, yet, by fixing the lower disc upon a spindle, and attaching the upper disc or piston to the rod *at points which divide the whole area of the discs into two unequal areas*, as soon as the machine is set in motion, and the upper piston is drawn upwards by the rod, it leaves a vacuum below it in the working barrel, when the fluid below from its tendency to rise into the vacuum, presses equally over the *whole surface* of the under side of the lower valve; in consequence, however, of the eccentric suspension of the lower valve, there is a greater amount of pressure over the larger area of the two into which the surface is divided, and this extra pressure causes the valve to vibrate on the spindle, and in so doing, forms a passage for the fluid. When this up stroke is completed, and the upper disc (which we will call the piston) is pressed by the rod to effect its descent, the lower disc (which we will call the clack) is then closed by the amount of extra pressure of the water on the upper side of its larger area, and the same principle which opens the clack, acting on the under side of the piston, it is disengaged from contact with the barrel, excepting at two infinitely small points (the imaginary termination of its minor axis,) presenting a very small surface in its descent through the fluid which had already passed the clacks. As soon as this down stroke is completed, and the up stroke commenced, the piston returns to its oblique position, lifting and discharging the fluid. A power of raising water is thus acquired by a new mode, but still resulting from the simple and unerring law of its own pressure. The improvement sought for was thus obtained; a pump was made entirely of metal—to a certain extent, therefore, of imperishable materials—and not liable to the derangement arising from those casual circumstances already alluded to.

As models fail to be convincing, two 10 inch pumps were made by Mr. Charles Robinson, of Pimlico, similar in every respect, with this exception, that one was

fitted with a packed bucket, and butterfly valves, the other with the patent elliptical discs; and Mr. Robinson has been kind enough to allow these two pumps to remain at his works for the practical satisfaction of such as may not be convinced by this description.

This size of pump, viz. 10 in. diameter, was chosen because the friction of a 10 in. pump was considered to absorb nearly the whole power of a man. So that the old and new modes would in such case stand fairly contrasted. The result turned out to be so, for the packed pump was very difficult to move, whilst that with the patent discs was worked with the greatest ease; so much so, as to make it evident to a common observer, that a man could do three times as much work with the patent as with the common pump.

This fact naturally induced the patentees to investigate the relative friction of the two pumps. The column of water was 5 feet in each; the diameter 10 inches, so that the weight of water was 170 lbs. nearly. The levers of the pumps were 6 to 1, and it required 49 lbs. at the extremity of the lever of the packed pump to make the upward stroke 49 × 6 = 294. But this was not all; for it required 28 lbs. over a pully to return the bucket, 28 × 6 = 168 lbs. Here therefore was exerted a force of 462 lbs., to raise a weight of water not exceeding 170 lbs., leaving 292 lbs. as the value of the friction; whereas, it only required 33 lbs. at the end of the lever = 33 × 6 = 198 lbs. to raise the water with the patent pump; and as the piston returned of its own accord, deducting the weight of water, the friction was only 28 lbs.

The patentees expected to find some known data, or acknowledged rules, for determining the friction in pumps generally; but they were disappointed, while nothing could be more conflicting than the opinions of practical men on this subject, some fixing it at ¼th or ⅓, when in fact there is no law to determine the friction *à priori*, depending, as it entirely does, upon the packing of the bucket, and the ease or difficulty with which the valves open and shut. Their experiments have led them to the conclusion, that in any and every packed and valved bucket which delivers faithfully the quantity of water due to its diameter and length of stroke, the power necessary to overcome the friction exceeds that which is requisite to raise the water.

A pump 10 in. diameter, with an 8 in. stroke, should deliver 2 gallons of water per stroke. Amongst the old dicta there is one of Desagulllier's, recorded in almost every treatise on the pump, to the effect, that with the best made pump one man, making a full day's work, ought to raise a hogshead of water, 10 ft. high, per minute. Now, suppose this hogshead to contain 54 gallons of 10 lbs. each = 540 lbs. raised 10 ft. high, = 5400 lbs. of water only, exclusive of the friction of the bucket and valves, raised one foot high in one minute; but if the friction is to be 292 parts out of 462, this duty is impossible.

There is no longer any doubt that the friction in packed pumps is a serious quantity, increasing as the circumference and depth of the moveable bucket are increased, and absorbing power, both in the downward or return stroke, as well as in the upward discharging or effective stroke, while the metallic disc piston can be made sufficiently strong for any unlimited diameter of pump, by ribs, or other contrivances, without materially increasing the thickness at the periphery and consequently, the rubbing surfaces. Moreover, the friction will only exist in the upward or discharging stroke, and will never exceed what is due to the weight of the column of water tending to keep the piston against the sides of the barrel, instead of the undefined amount arising from the uncertain packing of the bucket in order to prevent the water slipping, both during the upward and downward stroke.

We have already shown what was the comparative friction of the two pumps at Mr. Robinson's, with a 5 ft. lift of water; and by way of illustrating the preceding observations, an experiment was made with another pump, intended to be 10 in. diameter, but bored rather larger, fitted with a cover and a branch to receive an ascending pipe; the pump-rod, of course, working through a gland and stuffing-box. Pipes of the same diameter were added to the branch, until the height from the level of the water in the well to the point of discharge was 15 ft. 4 in. The weight of such a column of water is 550 lbs. The lever in this case was also 6 to 1, and 98 lbs hung on the end accomplished the discharging stroke; hence

98 × 6 = 588 — 550 weight of water = 38lbs. for friction, or about $\frac{1}{15}$th part of the whole, being 10lbs. more than with the 5ft. column, without allowing for the friction of the rod working through the stuffing-box, and also for the trifling addition to the pump's diameter; thus showing that friction does increase with the height of the column. But in a pump on this principle, the increase is confined to a cause which cannot be removed.

The same opportunity was taken advantage of to approximate to what might be considered the *maximum* duty of a man whilst working with a pump of this construction. Two men made 41 strokes in *one* minute, lifting 2·24 gallons, or 22·4 lbs. of water 15ft. 4in. high at each stroke, which is equivalent to 14,107 lbs. raised one foot high in one minute by two men; and half that quantity, viz., 7053·5lbs raised the same height by one man.

The leading recommendations of these pumps consist in their *simplicity*—their *durability*, from being made of materials not of a perishable nature, and, unlike those of other pumps, improvable by use —and their great increase of *power*, in consequence of the abated friction in the *upward* stroke. So great is this last advantage, that on this account alone pumps of a larger diameter may be substituted for those now in use, and worked by *the same* power; nay, as the friction in the downward stroke is reduced to a minimum, a continued exhibition of the same power would, by the alternating effect of a crank, work *two* pumps of the same larger diameter. Take, for instance, ships in general, and a ship of 120 guns in particular, the pumping provision for which consists of 4 chain pumps, 7 in. diameter, and 4 hand pumps 6 in. diameter, employing, when at work, from 120 to 140 men: the united areas of these 8 pumps is 267 in.; while four 10 inch pumps upon the patent principle, with a united area of 314 in., could be easily worked by about 16 men, and the same extraordinary proportion would exist in every ship, whether in the navy or in the commercial marine. Nor would this increase of power be the only advantage. One frightful evil in all ships' pumps is, their liability to be choked, by rubbish getting into them. In the case of the ship *Erin go bragh*, from Quebec to Liverpool, as noticed in the morning papers of the 16th and 17th December, 1841:—"The extremity of this vessel was so great that she sank immediately after the packet ship *Roscius* had been the happy means of saving the captain, crew, and one passenger. She was laden with flour and grain, the latter having *choked the pumps*." This, unfortunately, is not a solitary instance of loss at sea, arising from the inadequacy and incapacity of the pumping provision, particularly instanced in the liability of the pumps to choke. Now it is a prominent feature of the patent pumps that *they cannot choke*. There are no valves to be so affected; while at every stroke, both the piston and clack clear themselves, and allow any extraneous matter that has got into the barrel to be discharged.

In these collective points of view, these pumps will recommend themselves in all mining and pumping operations where durability and increase of power are desired, and in all manufactories, particularly in those where liquids of a high temperature are to be raised, and sugar works in the colonies where the cleanness of the pump, and its freedom from destruction and choking are considerations.

To navigators, contractors, quarrymen, &c., having much water to get rid of but no great height to deliver it, these pumps would be an enormous saving, since hand pumps, with a short lift, could be made of a large diameter. One man, for instance, might work a 15 in. pump, the lift not being more than 3 or 4 feet.

67, Mark Lane, December 17, 1841.

Description of the Engravings.

Fig. 1. Is a plan of the piston, a section of which is shown by Figs. 3 and 4. A B the major, C D the minor diameter. R is the joint, (by which the pump-rod P is secured) the centre of which is in the true line of the major diameter A B, but neither in the centre of the pump or piston; being removed therefrom more or less as the diameter of the pump, the altitude of the column of water lifted, and other circumstances, may require. The whole area of the piston is therefore divided into two unequal areas.

Fig. 2. Is a plan of the lower valves, which is fixed in the barrel by means of the axle O, the eccentricity of which is regulated upon the same principle as

that of the joint in the upper valve or piston.

Fig. 3. Shows the relative position of the piston and valve during the upward or effective stroke.

Fig. 4. The same in the downward, or return stroke.

ANCIENT COMBINATION LOCK.

Sir,—Perhaps the following description of a well-known lock of combinations may interest some of the readers of the *Mechanics' Magazine*. It has been translated by a friend from the old German work from which I have already furnished you with some extracts. The work itself bears date 1636, and in the account of this lock you will observe that reference is made to a still older work. Few who possess the lock are, perhaps, aware of its antiquity.

I am, Sir, with respect,

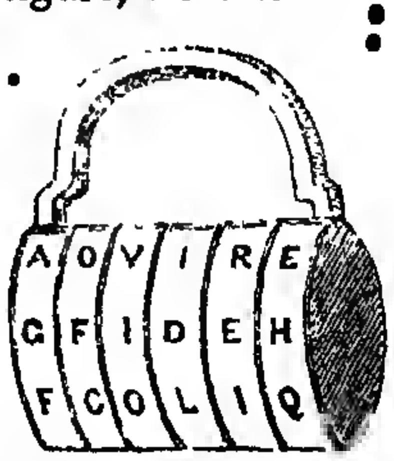
Yours, &c.,

U. S. HEINEKEN.

Sidmouth, November 27, 1841.

Of a Lock without a Key.

Gustavus Selenus, in his *Cryptographia*, p. 489, explains, from Cardanus Johannes Butens and Johannes Jacobus Weckerus, how to make a lock which may be opened and shut without a key; and as such locks are common, both in our own and foreign countries, I will endeavour to explain in this place how they ought to be prepared, but at the same time refer the readers to the above-mentioned authors. The form of the lock is this, (see figure, a fac-simile of the ori-



ginal.) But we will teach from Gustavus Selenus a table by which such a lock may be opened. Such locks have generally four moveable rings, whereupon all manner of letters are engraved, and a certain name as Rudolf, Petrus, Ursula, or other such names which have six letters. Now, one may change the letters of such a lock 1296 times. But in order that the change may be rightly understood, we will, as we have said, give instructions how to make a table. And, first, we will suppose that there is only one ring; afterwards, two; and then, three; and lastly, four. But we will show it, not by transposition of the letters which are graven upon the lock, but by means of numbers. They shall have, then, the numbers 1, 2, 3, 4, 5, 6. If there were only one ring, a table of six numbers would be enough; if the lock has two moveable rings, there would be thirty-six changes, as is seen from the annexed table; with three rings, the table would be made from the second table, by setting them after one another in rows, six times, and then before the first rows to place 1, before the second, 2; before the third, 3; before the fourth, 4; before the fifth, 5; and, lastly, before the sixth, 6. Thus, there are 216 rows. Lastly, suppose the lock to have four rings: the table would be made from the third, by placing it six times, as by—(?) the others; and before the first rank, every time, put 1; before the second, 2; before the third, 3; and so on with the fourth, fifth, and sixth. Then such a table will comprise 1296 changes. So, when the lock has five moveable rings, the table must be made from the preceding rings, and will produce 7,776 changes; for 6 multiplied into 6 will produce 36, and 6 times 36 = 216; again, 6 times 216 = 1,296; and, lastly, 6 times 1,296 = 7,776. The sixth table would have 46,656 changes. I will here subjoin a table with three rings, (as the table with four rings may be easily made from it,) in order that this proposition may not become too long. (See Table I.)

As we have said above, that we have used the numbers instead of the letters graven on the lock, it follows how the preceding numbers may be expressed by letters. Let us suppose that in the fourth table the first ring has six letters, O F C S D A, the second ring O T O A E M, the third T D L N V A, the fourth R E T A S T; and, preserving these four arrangements, let such letters be represented by one of the numbers 1 2 3 4 5 6, in any order that you please, in the manner in which the following table is made. (See Table II.) Thus, if one reads the rows one after the other, from top to bottom, you have the six words, O V T R, F T D E, C O L T, S A N A, D E U S, A M A T. Now, in the

fourth table, these words will be represented by the numbers 1 3 6 4, 3 4 1 1, 2 5 2 5, 6 2 4 3, 5 1 5 6, 4 6 3 2. One can also, by another arrangement of letters, find other words upon the ring, as F T A T, S T L E, D T V T, A U L A, to which will answer the numbers 3 4 3 2, 6 4 2 1, 5 4 5 5, 4 3 2 3. Now, he who wishes to open the lock, and does not know the name on it, must try every arrangement, one after the other, from the table, and at every arrangement draw the upper part of the lock towards the right-hand, until it comes out, and the opening of the lock must certainly follow.

Q. E. D.

[From *Schweuter's Deliciæ Physico-Mathematicæ*, 1636.]

TABLE I.

1	11	111	211	311	411	511	611
2	12	112	212	312	412	512	612
3	13	113	213	313	413	513	613
4	14	114	214	314	414	514	614
5	15	115	215	315	415	515	615
6	16	116	216	316	416	516	616
	21	121	221	321	421	521	621
	22	122	222	322	422	522	622
	23	123	223	323	423	523	623
	24	124	224	324	424	524	624
	25	125	225	325	425	525	625
	26	126	226	326	426	526	626
	31	131	231	331	431	531	631
	32	132	232	332	432	532	632
	32	133	233	333	433	533	633
	34	134	234	334	434	534	634
	35	135	235	335	435	535	635
	36	136	236	336	436	536	636
	41	141	241	341	441	541	641
	42	142	242	342	442	542	642
	43	143	243	343	443	543	643
	44	144	244	344	444	544	644
	45	145	245	345	445	545	645
	46	146	246	346	446	546	646
	51	151	251	351	451	551	651
	52	152	252	352	452	552	652
	53	153	253	353	453	553	653
	54	154	254	354	454	554	654
	55	155	255	355	455	555	655
	56	156	256	356	456	556	656
	61	161	261	361	461	561	661
	62	162	262	362	462	562	662
	63	163	263	363	463	563	663
	64	164	264	364	464	564	664
	65	165	265	365	465	565	665
	66	166	266	366	466	566	666

TABLE II.

1	3	2	6	5	4
O	F	C	S	D	A
3	4	5	2	1	6
V	T	O	A	E	M
6	1	2	4	5	3
T	D	L	N	U	A
4	1	5	3	6	2
R	E	T	A	S	T

PRACTICE AND PRACTICIANS, *v.* MATHEMATICS AND MATHEMATICIANS. —MR. CHEVERTON ON S. Y.'S REJOINDER.

Sir,—I would gladly have been saved the necessity of making any remarks upon the last communication of your correspondent S. Y.; but it is impossible for me to be silent under the imputation of having myself written the censure which I lately quoted from the pages of your Magazine, as having been inflicted upon him, many years since, "by one who appears to have known him well."* I am not aware that my notions of what is fair dealing are too refined; but if I had really been the author of that censure, my writing respecting it in the manner I recently adopted would, in my estimation, have been nothing less than a deliberate falsehood. I must, however, do S. Y. the justice to admit, that he may not have viewed the imputation in this offensive light; for those blunted perceptions of what is just and right, which have enabled him without compunction to put forth gross and deliberate, because written, misrepresentations of another's opinions, may naturally enough incapacitate him from distinguishing clearly the respective boundaries of truth and mendacity.

I have no apology to offer S. Y. for the personality of my remarks: a writer who descends to the gross misrepresentations of which he has been guilty compromises his *character*, and therefore to

* The censure in question appeared in your third volume, at page 438, and the communication which contained it was signed, "James Yule, 63½, Red Lion-street, Clerkenwell." For myself, I know nothing of your correspondent S. Y., beyond what has appeared in the pages of your Magazine.

denounce the one is necessarily to expose the other. The *man and the manner* become unavoidably, in this case, the objects of just reprehension; there is no choice or discretion in the matter; and though your correspondent may feelingly deprecate such observations, as being "impertinent" and "irrelevant," which they assuredly are in respect to an argument, yet are they exceedingly to the purpose in reproving a moral delinquency. His notions of pertinency and relevancy appear to accord with the practice of turning things upside down—he would have me, I suppose, reason with, or defer to the misrepresentation, but rebuke and admonish the argument. To enter into discussion with such a writer, on the merits of the subject at issue, is quite out of the question, even though his paper had been as full of argument as it is of misconception, perversion, and misrepresentation.

Desirous as you and your readers must be, Sir, that a correspondence of this nature should speedily close, and in the mean time be made as concise as possible, still I fear it is demanded of me in justice, that I should cite one instance, at least, of those misrepresentations of which I have accused your correspondent. I shall select one from his *last* communication, for it shows that the habit is incorrigible, at least while he continues under the shelter of an anonymous mask. He says, "Mr. C. does his best to persuade [us] that the science which is more general in its application, and more extensively useful than any other, is a *noxious science;* that it produces something worse than 'baneful effects,' &c." The mathematics a noxious science! There needs no other proof of misrepresentation—it is apparent on the very face of the assertion; for who, that is removed one degree from an idiot, would express such an opinion, or venture to persuade others to adopt it? It is true, I have used the phrase "baneful effects," but the reader shall judge by the context whether it conveys the idea of the mathematics being in my opinion a noxious science, or is calculated to impart that impression to others. Alluding to, and subsequently referring to, the commonly received mathematical formula for determining the integral amount of the force of steam during its expansion—referring to it as being founded exclusively on the law of elasticity—referring to Mr. Pilbrow's entire faith in it, as being a full, instead of a partial and fallacious, mathematical expression of the force developed—referring to the new form of steam-engine, which he had invented for the purpose, (among other objects,) of appropriating, as he conceived, to a much greater extent than usual, the power to be thence derived—and referring to the sanguine, but deceptive expectations which he, "as not being, perhaps, himself a mathematician," entertained on the subject—I gave it as "an instance, not at all uncommon, of the *baneful effects* which a *blind indiscriminating admiration* of the science, or even an imbibing of the spirit of the science, has generally upon our modes of thinking and reasoning."* And as an instance of the ludicrous, rather than the baneful effects, of imbibing the spirit of the science, in reasoning upon general topics to which it is inapplicable, I gave the quotation from a Poor-law Commissioner's Report. It will be seen that "baneful effects" are not here charged even upon the abuses and misuses of the science, as they justly might, without reproaching it as being a noxious science; but they are described as flowing from "a blind indiscriminating admiration" of it, or from an imbibing of the spirit of it, in the treatment of matters to which it is alien. A more disgraceful misrepresentation, therefore, of a writer's opinions, than that of which I complain, has never appeared in the pages of your Magazine. But suppose that, by a slip of the pen, or from a carelessness or a difficulty in turning an expression, a qualifying remark should on any occasion be unfortunately omitted, but which in the present case did not occur, what can be thought of that man who would fasten upon a phrase an opinion which he cannot but know is not only contrary to the spirit of the article criticised, but is disclaimed by the writer of it in express terms? My words were these—"I cannot think that the *candid* reader will infer, from what I have written, that I am insensible to the real

* I had intended to give an instance of the baneful effects to which I here allude, as arising from the mathematical spirit in which subjects belonging to moral philosophy are often treated, and in which the reasoning concerning them is often conducted; but I find my thoughts have extended to too great a length for insertion in the same number with the present paper.

value of the mathematics, as displayed in its proper sphere; or even to the occasional and partial *utility* of its more mixed investigations, if used with proper reserve, and with strict subserviency to physical science;" and yet, in the face of such a declaration as this, your correspondent says, that I "do my best to persuade him and others that the mathematics is a *noxious* science"—and S. Y. is an honourable man! Sir, I shall not have written in vain, if an earnest denunciation of wilful misrepresentations should excite in the breasts of your readers such strong feelings, as to the moral obliquity which the practice involves, as shall secure for it on all occasions an indignant and deterring reprehension.

I conclude with one word to the general reader. It may by some be thought superfluous to descant on the abuses of a subject: so it would, if they were generally recognised as such; but the misfortune is, that they are perpetuated precisely because, the mask not being taken off, they pass current as the proper use of things.

I am, Sir, yours, &c.,

BENJAMIN CHEVERTON.

P.S.—As the opportunity offers, I may as well avail myself of it to correct a very amusing misconception (nothing worse) which S. Y. entertains of the class of men to which I refer by the designation of "Practicians." He actually appropriates it to himself and the operative mechanics, and very modestly declines the praise which I have bestowed on "practical men," "practical talents," "practical processes," and "practical methods of investigation." Nay, he says that his is "the less educated class;" and he cannot think of admitting, what he imagines I have been doing my best to persuade them, that his, "the less educated class, is the superior of the two"—the two being the working men and the mathematicians! I should have as soon thought of calling the manufacturing chemists, who furnish our laboratories with potassium and sodium, *philosophers*, on the strength of the discovery of those metals by Sir Humphry Davy having justly entitled *him* to that appellation, as of bestowing on our worthy and industrious artisans the honour and praise which belong to a Brindley, a Smeaton, a Watt, a Rennie, and a Telford. These were "practical men," but they were men whose shoe-latchets few of our mathematicians were worthy to unloose—men, whose fame will descend to all times, and in respect of whom, or at least of one of them, whose fortune was no bar, Arago has said, that it is a reproach to the nation he was not raised to the peerage. Of the same class, though possibly of a lower grade, are the men whose practical talents have originated, and brought successfully into action, the various enterprises which characterise our times. Take, for instance, the projectors of steam navigation; and, for a late example, the parties whose practical acumen and professional skill have contributed, in any department, to the success of the *Great Western* steam-ship. It is to directing minds like these that the terms "practical talents," and "practical men," are applied, by every one who understands what he is talking about; but your acute correspondent, S. Y., it appears, has been dreaming all along that they refer—in the case of the *Great Western*, for example, to the shipwrights, the "engineers," and the stokers employed—to the last class of men especially, for they are more "eminently practical," that is to say, harder working, than any of the others.—B. C.

LEWIS'S PARALLEL MOTION FOR PUMP WORK.

[Registered pursuant to Act of Parliament.]

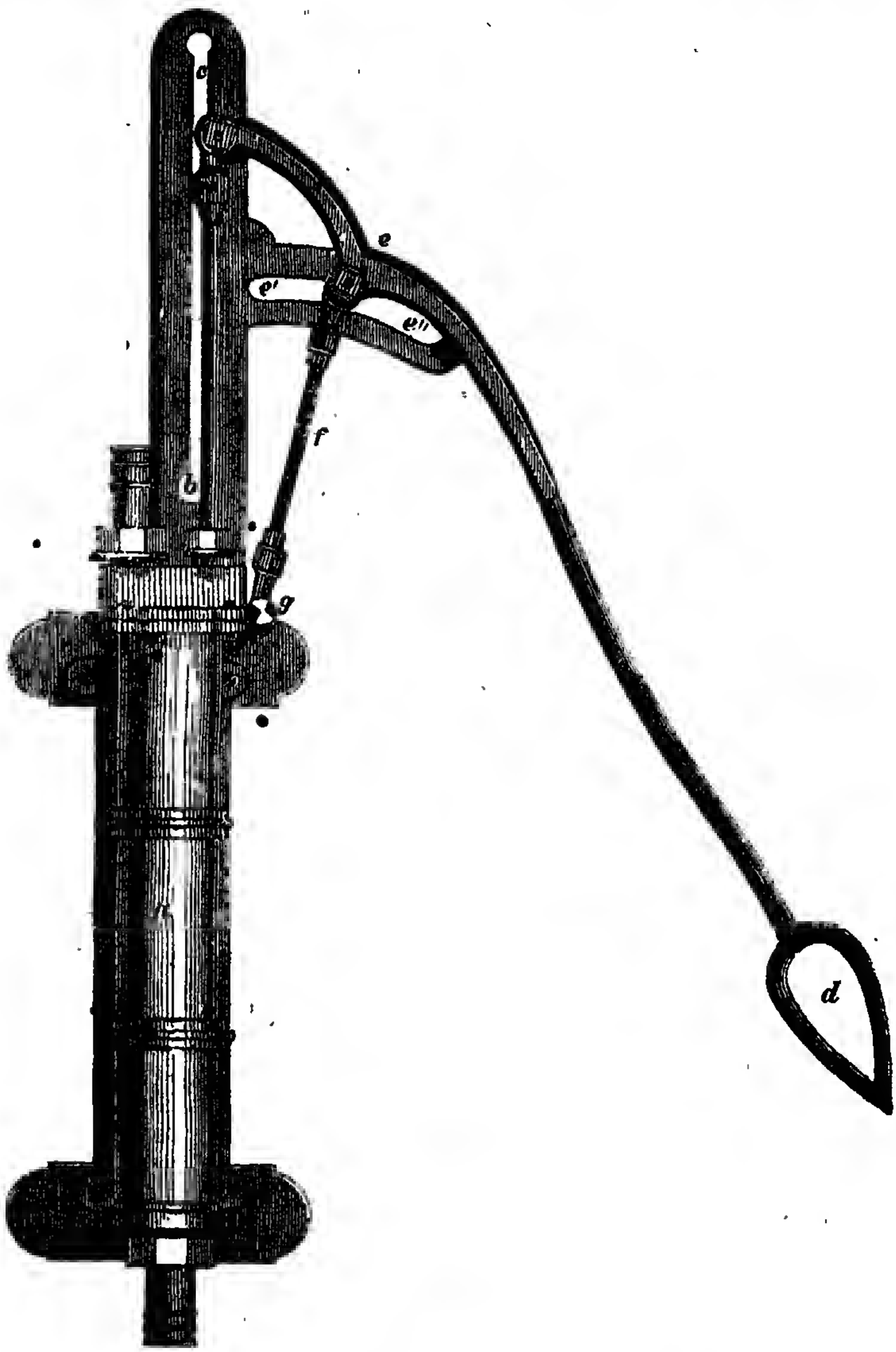
The annexed engraving exhibits a lifting force-pump recently designed by Messrs. Lewis and Co., of Stangate-street, in which they have introduced a novel substitute for the slings and guides heretofore employed for preserving the parallelism of the piston-rod. The novelty of this arrangement consists in the employment of a movable fulcrum, which describes the arc of a circle, while the piston-rod, and the end of the lever or handle to which it is attached, moves up and down in a straight line.

In the illustrative engraving, *a* is the working barrel of a lifting force-pump; *b*, the piston-rod, attached directly to the lever or handle *c d*, at *c*, and furnished with an anti-friction roller, which works in a slot formed in the upper limb of the pump-frame or standard. *e* is the ful-

crum of the handle bearing on the fulcrum-rod *f*, which rod works upon a joint affixed to the standard at *g*.

On working the handle *d*, the top of the piston-rod moves up and down perpendicularly in the line *b c*, while the fulcrum *e* describes the arc *e′ e″*.

By means of this arrangement, the



height of the pump is reduced full one-third; and its compactness is still further increased by throwing the piston-rod a little out of the centre, so as to get its stuffing-box, as well as the rising main, both within the space of the pump-barrel. There are only two valves employed in this pump, viz., one in the piston or

bucket, and the other at the bottom of the barrel; the latter of which is so ingeniously arranged, as to be accessible and removable at pleasure, by merely unscrewing the union joint which connects the pump with its feed-pipe. The action of this pump is remarkably pleasant and easy, and its compact form recommends it as peculiarly adapted for situations where saving of room is an object; while, by the addition of an air-vessel, it is at once converted into an efficient fire pump.

Although shown as applied to a lifting pump, this motion is equally applicable to a forcing pump, by changing the lever from one of the first to one of the second order.

ON THE PROTECTION OF MANUFACTORIES, ETC. FROM FIRE.

Sir,—I have perused with much gratification the "Practical Suggestions for the Protection or Manufactories from Fire," at page 2 of your 960th number; if the same quantity of forethought and prudence exhibited by "A Manufacturer" were generally found to prevail, the entire character of London fires would be completely changed. His narrative clearly shows at how trifling expense an efficient safeguard against fire can be provided.

If the subject of fire were one more generally attended to, the present mass of ignorance respecting the best means of suppressing it, would soon give way to better notions. That water will extinguish fire, is admitted on all hands: but the necessity for providing water, or taking any measures towards its efficient application, seems to be a matter altogether beyond ordinary apprehension. Even the power of the one element to subdue the other, is very imfectly understood, and hence results incalculable mischief. Few persons have any idea of the small quantity of water that will suffice to stop the early progress of a fire. Let but the burning surface be covered with a film of water, no matter how thin, and combustion is at an end. By mechanical aids a single teacup-full of water may be made to cover upwards of six square feet, and therefore, to extinguish that quantity of burning material.

Mr. Loudon, in his Suburban Gardener, directs that "on the ground floor of a house, immediately within the outer door, one of Read's syringes (or some other equally efficacious) ought to be kept, and every male person in the house instructed how to use it. Precautions of this kind are useful *as leading to habits of carefulness and forethought*, which, after all, are the surest means of preventing accidents by fire." Many a fire that might on its first discovery have been extinguished by a single bucket of water, has been permitted to rage unchecked until more powerful means could be brought to bear, by which time it has become altogether beyond suppression. The recent destruction by fire of the Derby Town Hall, is a remarkable case in point.

Even firemen, from not having a clear perception of the subject, are continually doing more damage with water than is done by the fire itself, by using the former in quantities greatly beyond the requirements of the case. There are few rooms, the surface of which could not be covered by a *few pints* of water, and the effect of bringing an ordinary fire-engine to bear upon an apartment in the manner usually done, is to drown it and all beneath. An ordinary fire-engine throws about one gallon of water at every stroke, and makes from 60 to 70 strokes per minute, so that in the space of a very few minutes, several hundred gallons of water are needlessly thrown into the room, drenching the lower part of the building.

We continually find that persons having large properties at stake, take no steps towards the protection of their premises, under the false impression, that this can only be accomplished by some powerful expedients provided at a great expense. The fact is, that, merely "*a pail of water under each workman's bench*," would in many cases have sufficed, and would in several instances, within my own knowledge, have been the means of saving thousands of pounds' worth of property. I have a model fire-engine of a very small size, which has on more than one occasion stopped the spread of fire, and saved property to a large amount.

A bucket, a syringe, or a pump of the smallest calibre, with capacity on the part of some one to make a prompt application of them, would in nine cases

out of ten arrest the progress of incipient conflagrations, which, for want of such timely opposition soon extend far beyond the powers of human skill.

The late Mr. Russell took great pains to introduce the fire-pump, but he was neither the originator nor improver of it. The lifting force pump fitted with an air-vessel had been used as a fire-engine nearly a century before Mr. Russell's time, and is an article that has been regularly supplied by all engine and pump makers for many years.

A mistake too often prevails in fixing these pumps; they should invariably be placed, with the handle at least, *outside* the premises, and not within. Astley's theatre was provided with a pump of this kind, which, if it had been placed externally, would most likely have saved it; but being placed within the building, no person had courage enough to stand amid the smoke to work it, and the fireman was forced to drop the branch and make a hasty retreat.

Where there is a well, or wherever a large tank can be sunk and connected with some certain supply of water, a fire-pump is invaluable. It should be enclosed within a strong casing to protect it from frost, from dust, and from wanton injury; one length of hose should always be attached to the nosel of the pump (unless the water is used for ordinary purposes,) and two or three lengths more of hose should be coiled on a hose-reel within the casing of the pump. Above all, the branch pipe should be provided with a *spreader*, in order to produce the *film* of water, of which I have before spoken, and by which so large a surface may be covered with the smallest quantity of water.

I propose at some convenient opportunity, to make a further practical application of some of the points herein alluded to, which time will not permit me to do at present, and remain,

Very respectfully, yours,

Wm. Baddeley.

29, Alfred-street, Islington, January 7, 1841.

PREVENTION OF FIRES.

Sir,—The observations of your indefatigable and sagacious correspondent, Mr. Baddeley, on the efficiency, or inefficiency of fire-engines, the supply of water, &c. &c., are very cogent, as is every thing he writes. But I would wish to draw his very valuable attention to the old axiom, that, "*prevention is far better than cure.*" Now, the "prevention" of houses taking fire was mainly and very effectually invented fifty years (?) ago, by the very intelligent Mr. Hartley, who, in conjunction with Sir Joseph Banks, constructed a house on Wimbledon-common, which still exists in perfect repair. The propinquity of this house has latterly been remarkable for several fatal duels. But to the purpose of *prevention* from fire. We have no word like the French "*incendie*," to signify the burning of a house, &c. Our word "fire" applies to the fire in the kitchen, parlour, &c.; but let that pass—to the purpose of this note. Mr. Hartley covered the ceilings of his rooms with very thin sheet-iron, and in some cases the sides and floors. This is cheaper than lath and plaster, or handsome paper. The iron "*Latine plate*" can be painted any colour or pattern, and will resist all damp far better than plaster and paper. Pulled off one wall, it is as good as new to put on to another; in fact, if both sides of the plates be protected from the damp, by coal-tar or varnish, they must last to "the end of the world." The best adjunct to this very excellent and perfect preventive from fire of Mr. Hartley's would be, the proposal I published, many years ago, in your invaluable Magazine, *i. e.* to construct the stairs of houses (when not of stone,) of iron. Sheet-iron for the steps; cast-iron for the balusters and supportings. But this, although at least as cheap as deal wood, will be opposed by the deal-mongers, who, of course, rejoice in the burning of deal houses and their inhabitants! In the course of three years, the two houses of Parliament, six great mansions, and, I understand, the Royal Exchange and Tower armoury, have been consumed, owing to fire-flues being in contact with wood!! Now, a wise legislature would certainly inflict the very highest penalty of the law, whether death or transportation for life, on any architect or builder guilty of so stupid and reckless a conjunction! There is now a "*Fire Preventive Company*," of which I shall send you an account, when I can get at my papers. *A patent* for putting plaster on the walls of rooms! Ridiculous! Plaster made of Roman cement and size! A

combination I recommended in your Magazine in 1825. Are not 99 rooms out of 100 covered with plaster? The floors of our flimsily-built houses would not retain a coating of plaster, without its cracking to pieces in a week.

There is another point on the subject of *prevention* of house-burning which I will briefly mention. In the luminous, well-arranged, and comprehensive statistical account of the fires of London, yearly furnished to your Magazine by your benevolent Mr. Baddeley, it appears that the greater number of fires occur in the houses of licensed victuallers, *i. e.* public-houses. Now, our legislators are ever and anon exercising their legislative wisdom upon the publicans whom, it appears, they take to be the greatest "*sinners*" in the community. I find that numerous fires occur from the contact of a candle with the bed-curtains, or window-curtains. Now, a good *preventive* law would be, to oblige all hotels and public-houses to have their curtains of any stuff, except cotton or linen. Wool and silk will not break out into a flame. It is useless saying that people *should not* read in bed, or place their candle on a dressing-table close to a curtain. They very often do so, and we see the consequences.

To those who cannot afford to change their cotton curtains for woollen or silk, I will suggest a sure preventive. After the curtains are washed, steep them in a solution of one pound of alum in one gallon, or rather more, of warm water; then hang them up to dry, after being wrung in the usual way. The same alum-water will do again—but alum is cheap.

Although my friend Mr. Hartley, the nephew of the inventor and the constructor of the fire-proof house on Wimbledon-common, has lately published a comprehensive pamphlet on the conclusive experiments made in his uncle's house, such as piling faggots on the floors, six feet high, so as to cause a most intense fire, impinging on the ceilings, without either these, or the floors, or walls, being in the least injured, no attention has been paid by the public to so important an expedient. I will endeavour to send you a copy of this pamphlet, out of which you will, perhaps, be disposed to give some extracts to the public. I remember that, some years ago, Mr. Baddeley reiterated the sheet-iron suggestion and *practice* of Mr. Hartley; but I was sorry to see that so sagacious a philosopher should have hinted that a ceiling of lath and plaster would resist fire nearly as well as the iron plates. I have repeatedly found, that beams of wood may be charred by fire, through iron plates; but it will not break into a flame, without the admission of a current of air.

"Prevention is better than cure" is, in the case of fires, the motto of, Sir,

Your obedient servant,

MACERONI.

1, St. Martin's-place, Trafalgar-square.
January 10, 1842.

MATTER AND SPACE.

Sir,—Permit me to make a few remarks, in reply to those of your correspondent "E.A.M.," on a paper of mine, inserted in the *Mechanics' Magazine* last December.

I can see nothing likely to appear "disputable" in the term *medium of space:* it clearly designates locality and universality, and leaves its general utility inferable: whereas, "firmamental fluid" implies something of limited location and service. The firmament was made "to divide the waters from the waters"—"to divide the waters which were under the firmament from the waters which were above the firmament; and God called the firmament heaven." At present we know of nothing which agrees with the above description of firmament, but the atmosphere, which in no sense can be considered, like the medium of space, a universal cause.

I am much at a loss to understand what "E. A. M." means by a *freezing principle.* "Is not the medium of space the freezing principle, so long inquired about by philosophers?" A freezing element, or cause, is certainly more intelligible. The medium of space, by its pressure, expands water during congelation; it also expands water to overflowing of the vessel on a fire during ebullition. Its office is to move, expand, and to compress; and wherever these phenomena obtain, it is the cause. The material world has no other cause of action and effect. A freezing principle is as foreign to nature as a heating principle. Each phenomenon has its *theory*.

"E. A. M." asks, "Would it be pos-

sible for motion to occur within the medium of space, if it did not itself undergo a chemical change?" Does this mean that a body cannot have motion in a fluid unless the fluid be acid or alkaline? A grain of shot descends, and a piece of cork ascends, through every kind of aqueous fluid; even through quicksilver, iron ascends. If density be implied, planetary motion would be maintained, as at present, were the medium of space liquid gold, and were impulse, as in all cases of motion, constant and greater than resistance. Besides, the medium of space is aeriform,—motion a mere mechanical effect; and chemical qualities and chemical change are but adopted expressions, conventional terms, which belong to the chemical art only. Mechanical nature knows nothing, includes nothing, needs nothing of chemical matter, chemical properties, or chemical qualities.

"The friction attendant on *life*," being capable of producing *this* chemical or physical change which would permit motion through the medium of space, is new, too new, indeed, to be comprehended at its origin. It may, however, be asked, did not the earth perform its motions as regularly before the creation of man, as now it does with 800,000,000 of human beings on its surface incessantly *frictioning* about; or, to be within the limits of history, were the earth's motions in the least affected when all mankind, but eight, were destroyed by the deluge? As I boast nothing of super-astronomical knowledge, I must beg information, how "every *movement of animal life* tends to promote the circulation of the universe."

"Heat and cold are, as every one knows, sensations: but are caused by different *dispositions* of matter." Then it were to be wished, the chemist would say, what it really is which boils, and what congeals, water, instead of misleading the world by attributing boiling to the sensation, heat—freezing to the sensation, cold; and otherwise, all modern philosophy sayeth not, as to how these phenomena are to take place. Different "*dispositions of matter*" causing heat and cold, is open to any kind of interpretion, so vague is the expression. However, "E. A. M." admits, that physical heat and physical cold are wholly out of the question. Still, I imagine, some consuming or corroding ability possessed by fire, some innate essential ability whereby matter acts on matter is meant, but which cannot be correct. The atoms of matter and bodies are *inert*, therefore possess no self-acting ability whatever: they are unalterable, therefore are at this day the same in substance, size, shape, and essence, as the moment they were created; and bodies formed of them are as incapable of change from cold to hot, from hot to cold, from insipid to acidulous, as their inertia indicates, which includes unchangeability, and inertia is the zero of cause. Whatever is effected by fire, is effected only mechanically; nor is there in nature any but mechanical cause, mechanical effect, and mechanical result. The sensations which bodies promote seem to belong to those bodies; and thus is the simplicity of nature most strongly evinced in our being supplied, in sensations, with light, heat, cold, sound, acidity, and every thing our mind knows, without any thing similar belonging to the material world. Heat being admitted to be a sensation, what can "E. A. M." mean by "the sensation being caused by the motion of matter in the *form* of heat?" Shape and feeling are vastly different things.

The nervous fluid is the cerebral sense exciting cause in every instance, no matter what may be the resulting sensation. The medium of space is continuous from without through the nerves of sensation to the brain, and within the nerves it is the nervous fluid. As its pressure on the brain, promoted by external circumstances, increases, so is the sensation, heat, excited and increased; when the pressure is intense, the sensation is pain accompanied with rupture of blood-vessels; and as the pressure declines to the minimum, the sensation is cold, colder, and painfully cold. I would ask "E.A. M.," from having granted that heat and cold are but sensations, how "cold is caused by the presence of more of the medium of space than the vital energy can convert into heat?"—into the *nonentity* heat, or even the sensation, it being impossible, by all the energies of nature, to convert matter from what it is, to any state it is not, but as respects rest, motion, or locality.

All sensations are the mental result of the pressure, and degrees of pressure, of that portion of the medium of space which forms the contents of the nerves of sensation, on the respective organs of the

brain. "Recollection of a sensation," of pain, for instance, is not a sensation.

"E. A. M." is perfectly correct, if, in saying, that, "a white leaf and a black dye might express all the wonders of creation," is to be understood, that the theory of nature is so simple, any single phenomenon comprehended fully makes known the general theory. For, however diversified are nature's mechanical performances, (made tenfold so, to us, by the sensations they promote,) how far from complex must be the theory of a procedure, however universal, which has for substance only inert homogeneous atoms; and for cause, only pressure emanating from the general construction.

T. H. PASLEY.

Jersey, January 8, 1842.

ON MR. R. ARMSTRONG'S NEW THEORY OF DIFFUSION. BY C. W. WILLIAMS, ESQ.

Sir,—As you have given the publicity which your columns ever secure, to Mr. R. Armstrong's new and ingenious illustration of Dr. Dalton's theory of the peculiar manner in which gaseous bodies intermingle, termed, their "diffusion;" and as Mr. A. has demonstrated, (to his own satisfaction, at least,) in the working of Mr. R. Cheetham's smoke-burning patent, that Dr. Dalton's system of the diffusion of gases, *inter se*, means, in fact, their absolute *separation* from each other, it will be at least curious to know how this very original conception of the process of "diffusion" is made out and applied.

I have said, this new theory of Mr. A. is *ingenious;* indeed, I can only compare it to the process by which the philosopher would explain to the Prince of Abyssinia how to extract sun-beams from cucumbers. All that was wanting to *prove* Mr. Armstrong's theory, (and which I have no doubt he will supply, *suo more*,) was, to have added an algebraic formula, thus to establish the fact, that it was "mathematically correct."

Mr. A. tells us, that "it was with peculiar pleasure he *lately* heard" (three years ago this patent was explained in Mr. A.'s own book,) "of a most interesting application of chemical laws, in the newly-discovered process for burning smoke and economizing fuel, by Mr. Cheetham, by which those two important objects are effected in a manner far superior to any thing of the kind that has ever been seen before." The "particular chemical laws thus applied" being those of Dr. Dalton, relating to the diffusion of gases! And now for the theory and its application. Mr. Cheetham's plan, Mr. A. tells us, "consists in the compelling all, or most, of the carburetted hydrogen and other combustible gases, which escape inflammation, when first generated from the crude coal in the furnace, to *return again*, and pass through the fire, where they are converted into flame."

I would here stop just to ask a simple question, whether it might not be as well to effect the combustion of these gases at once, and by *a single operation*, thus avoiding the *second* circuit of the furnace and flues? The only reason which suggests itself for this burning but one portion of those gases in the first instance, and then ingeniously bringing the other portion round again by the circulating process is, that if all had been burned at the first operation, then would there have been no need or application for the new theory; for theories, as well as candles, were not invented to be put under bushels.

Mr. A. then informs us, that this process is effected by a very simple apparatus, namely, by a "small rotary fan, in connexion with that part of the flue through which the smoke is passing off to the chimney, after having left the boiler." I would here again ask, why make this smoke at all? and why burthen the flues and the boiler with this second current of so bad a heat conductor as smoke or soot? Except, indeed, for the pleasure of illustrating the new theory.

We are then told that the fan "*exhausts* the smoke from the smoke-flue, and propels it, by a return flue, to the inclosed ash-pit, whence it is forced through the fire-grate, where combustion (of this smoke) is effected, and the products of this *second combustion* (second combustion!) again passes under and around the boiler, and then up the chimney." A casual observer would here ask, how this smoke, so exhausted from the smoke-flue, after the *first* and *second* processes, and after having made this second circuit round the boiler, is prevented from making a *third* circuit along the same ground; and, in fact, making a sort of squirrel-cage move-

ment? Luckily, Dr. Dalton's theory thus explains this apparent anomaly, according to Mr. Armstrong's new version; for he would prove, that the smoke and unconsumed combustible gases, after having passed round the boiler, and being intermingled and diffused, under the Daltonian theory, are, by the magic peculiarity of a fan, and at the very same time, *separated*, (as chaff is from wheat,) the useless and incombustible gases alone passing up the chimney, while the combustible portion, thus miraculously *separated* under this diffuso-separative process, returns again, (under said squirrel system,) to the ash-pit, furnace, flues, and boiler. Thus we find that Dr. Dalton's theory of the intimate intermixture and diffusion of gaseous bodies without reference to their respective specific gravities, (long since admitted to be correct by the whole chemical world,) is now, by the new light chemistry of Mr. Armstrong, discovered to possess the additional peculiarity of separating the combustible from the incombustible gases, just at the moment when, by the same laws, they had become intimately diffused among each other. To this, however, must be added the peculiar action of a fan, which, also acting in a double capacity, propels the useless gases up the chimney, and sends the useful ones round again to the furnace! Who will hereafter despair of impossibilities?

Mr. A. observes, "your chemical readers" (doubtless he thought it was too profound for mechanical ones,) "will be aware that this *circulatory* process cannot go on without atmospheric air, and which air is admitted by a small aperture between the fan and the smoke-flue." How this *small* aperture can admit 360,000 cubic feet of air for each ton of coals, the theory sayeth not.

Mr. A. observes, "It was demonstrated by Dr. Dalton, that different gases act as *vacua* to each other, while Professor Graham has shown that the different gases have a tendency to diffuse into each other with different degrees of rapidity, which bears a certain relation to their specific gravity; and *hence* he, (Professor Graham,) shows that, by availing ourselves of this tendency in mixed gases, a sort of *mechanical separation* of the various gases may be effected." Here is a flight of philosophic ingenuity, with a vengeance! What will Professor Graham say of this "mechanical separation," thus attributed to his idea of the "tendency of gases to diffuse into each other?"

But, lest any doubt should remain on the subject, we are told in plain English, "it is precisely this *separation*," (after the previous diffusion,) "that is effected by Mr. Cheetham's process." How far Mr. C. may feel obliged to his eulogist, for this explanation of the process, I leave to him to say.

Now, the ingenuity of this philosophical diffusion-separation process reminds one strongly of the philosopher, (Swift's, I believe,) who suggested an equally ingenious mode of producing a diffusion of talent and temperament in the human species. His plan was, the taking a slice off the brain of the sanguine man, and exchanging it for a slice from the brain of the phlegmatic—thus virtually reconciling diffusion with separation. Equally ingenious, and equally practicable and valuable, is this with Mr. Armstrong's separation-diffusion theory.

(To be concluded in our next.)

PECULIAR CASE OF OXYDATION.

Sir,—Will you permit me, through your pages, to ask advice of some of your readers under the following circumstances:

I have a carpenter's stove for steaming plank in, which, when fully exposed to the atmosphere, I found the steam to condense so rapidly, as very much to lessen its utility. To counteract the speedy cooling I had it cased with plank on the outside of the flanges, by which its separate pieces are secured together, and the space between, say 2 inches, filled with sawdust: this effectually prevented condensation, and, as I fancied, answered my purpose; but on renewing a part of the casing after six months use, I found the stove rusted $\frac{1}{16}$th, or upwards, of an inch, and the decay apparently going on. Now, at this rate, it will very soon be holed through, and if some of your correspondents would, through the *Mechanics' Magazine*, favour me with advice, they would much oblige,

Your obedient servant,

A Constant Reader.

Glasgow, January 13, 1842.

ICE VELOCIPEDE

Fig. 1.

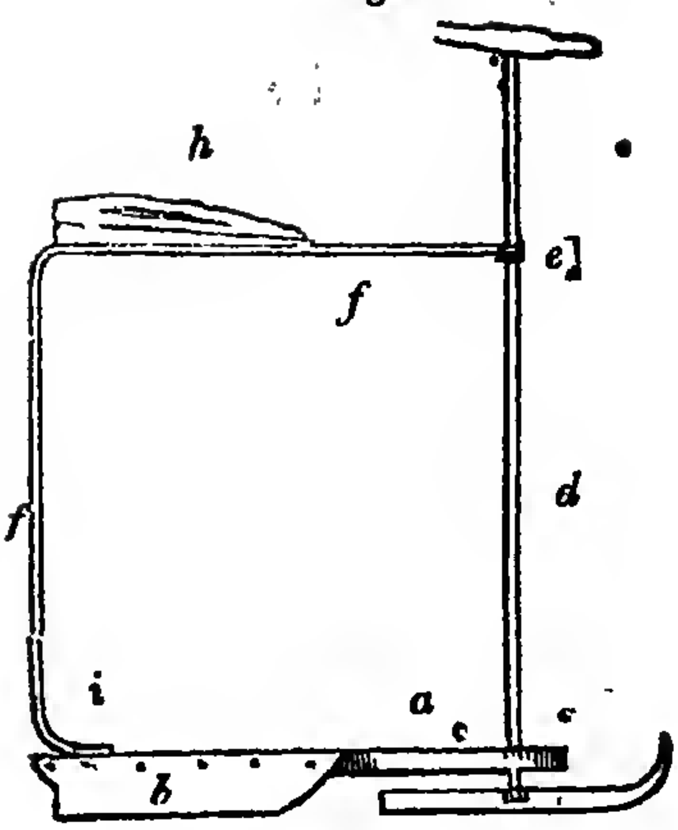


Fig. 2.

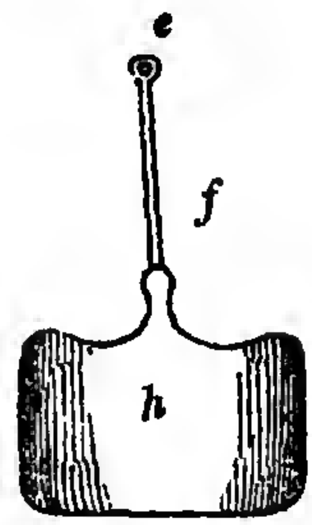
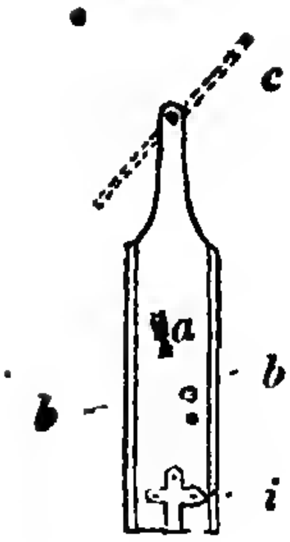


Fig. 3.



Sir,—If you think a description of the little vehicle named and sketched above worthy of a place in the pages of your Magazine, it is at your service.

I will only premise that I have made one, and found it to answer extremely well.

a, figs. 1 and 3, is a piece of board, 1 in. thick, 4 in. wide, and 18 in. long, made of the shape shown in fig. 3.

b b, two runners, made of steel, ¼ in. thick, 2½ in. wide, 11 in. long, screwed to the sides of *a*.

c, the front runner, 1 in. wide, 10 in. long, turned up in front like a skate, and slightly curved at the bottom edge.

d, a rod of ½-inch round iron, made with a clip at the bottom, by which it is attached to the runner *c*; it works in a hole at the point of the board *a*, and has a small shoulder at *e*, where the seat-iron *f* works on it, and a thumb-nut at the top, to secure the handle *g*.

The seat-iron is of full ½-inch round iron, flattened at the seat part; and the seat, which is of the shape shown in fig. 2, is covered with cloth, and stuffed. There are spring keys at *e* and the point of *a*. The height from the ground to *e* is 2 ft. 4 in.; from *e* to *g*, 10 in.: the weight of the whole is under 12 lb.

The method of using needs no description; it being only necessary to wear coarse worsted hose over the boots, to prevent the feet from slipping on the ice.

I am, Sir,
Your obedient servant,
J. R.

Hastings, January 10, 1842.

THE CAP OR DEFLECTOR LAMP, COMMONLY CALLED THE SOLAR LAMP.

Sir,—Messrs. Timothy Smith and Sons, of Birmingham, have, it appears, under the pretence of replying to the statement of "A Constant Reader," introduced my name, telling your readers that they have commenced an action against me, for selling a patented invention of Mr. Young's, which they please to term an infringement of the patent of Mr. Jeremiah Bynner. As this assumed important intelligence has really nothing to do with the matter in dispute, and was evidently intended to divert inquiry from its proper object, I trust you will permit me to keep the point at issue in its right position, namely—does the cap or deflector, which is the sole distinction between the Solar and other lamps, make a prominent feature in the expired patent of Upton and Roberts? I assert it does; and, in proof, refer to the specification of that patent, in which two lamps are described, by drawings and in words, both having caps or deflectors identical with those used with the Solar Lamps. The lamps are Nos. 4 and 9, and the specification is at the Petty Bag Office, where it can be inspected by any one. A great number of the lamps referred to were made and sold during the term of

the patent, from 1827 to 1841. Many of them are now in use, in various parts of England, and can be produced to vouch for themselves. Besides what has been stated, there is that which will, no doubt, be considered rather a peculiar feature in the case. Some hundreds of these lamps were made, in virtue of Upton and Roberts's patent, by Messrs. Timothy Smith and Sons, under the superintendence of Mr. Jeremiah Bynner, who was then acting as the foreman of Messrs. Smith's Lamp Factory, and this was at least two years before he obtained his patent. This is rather a startling fact, and will surprise those who know what has to be done to obtain a patent, whether told in your pages, or reserved for a court of law.

What I have here stated, Sir, are facts, which I am prepared to substantiate; they are facts which concern the public, and give the free and immediate use of these caps or deflectors to every one. If Messrs. Smith are desirous of making a statement, let them make one which will meet the point at issue. If actions at law are cited, let them be decided ones. The public are not, they may rest assured, to be hoodwinked by reference to an undecided action, which proves nothing, and may end, as such affairs not unfrequently do, in stripping a doughty assailant, like the ass in the fable, of the lion's skin.

I remain, Sir,
Your obedient servant
GEORGE UPTON.

Oxydator Office,
33, George-street, Hanover-square.
January 11, 1842.

THE LATE MAGNETIC DISTURBANCES.

"In the advance of knowledge, the value of the true part of a theory may much outweigh the accompanying error; and the use of a rule may be little impaired by its want of simplicity. The first steps of our progress do not lose their importance because they are not the last; and the outset of the journey may require no less vigour and activity than its close."—*Whewell, Hist. In.* sec. i. p. 118.

Sir,—The remarkable magnetic disturbance at the Greenwich Observatory had engaged my attention previously to your announcement of it in your last number.

An increased volcanic action, (aurora borealis,) has been occasionally observable at the north pole for a length of time. This has, of course, occasioned a great disruption of ice, and consequent approach of it towards the equator, the evaporation of which has filled the atmosphere with moisture. By the volcanic action of the 25th of September, the overloaded metallic fluids were shaken, and the additional moisture has been coming down ever since, like the dripping of an over-saturated sponge. It is not during the commencement of the derangement of the system that the pulse is the most affected, but at the crisis of the disorder. The liquid that is tranquil in the half-filled cup shakes on the brim. There can be no doubt that the sky, (the upper region of the atmosphere,) is the emporium of metal in a state of sublimation, or of electricity. To this metal moisture adheres. Look at a flake of snow—what else gives it its star-like form, with its serratures? I know not whether the geologist has ever thought of tracing his metallic veins to the sky—if he have not, behold a theory for him, worthy of his deepest consideration. I have another theory for him, on the subject of coral rocks. All in good time.

"In the next place," says the same learned authority from whom the prefixed motto is taken, "we may venture to say, that advances in knowledge are not commonly made without the previous exercise of some boldness and science in guessing."—Vol. i. p. 411.

A blunderer is better than one who cannot guess at all, and who rests satisfied with not knowing. I took it into my head, the other day, to place a great U before things unknown. What a number of U's! How many which there is no chance of expunging, while it is believed that matter can continue to move without a continuous force. Great a man as Newton undoubtedly was, "in sweeping the skies," he resembled "Dame Partington," or the silk-merchant who wanted to have all the silk-worms' eggs destroyed, because he found some moths amongst his cocoons. What had a moth's egg to do with silk? I have lately been told, that much of what I have brought forward is not new—that it *was* known to the ancient pagans. I know that: I know also that it *is* known to the pagans

of 1842. What of that? Do we not eat, drink, and sleep, as the pagans did, and do? Why should we not think as the pagans did, and do, in matters that do not interfere with our faith? It is just as absurd to think people are wrong in all things, as right in all things. The part of my Theory of the Universe* which I believe to be new is, that of the absorption of a universal fluid being the cause of the approach of solids to the earth—that the opposing currents of air are the cause of the approach of bodies without absorption—that there is positive cold, consisting of separate atoms, in a peculiar fluid—and that positive heat is a globular arrangement of the said atoms with the said fluid, the change being wrought through the medium of vegetable and animal existence, and that the continuance of all motion is due or caused by life. If this has all been made known before, I suppose the objection is also known. What is it?

I pretend to no more than a wish to make others see the beautiful view which I have seen. If any one is afraid of a "chamois-hunt," as Coleridge calls following a deep thinker, he can but turn back. I do not dispute the force of the attraction of a good fire, an easy chair, and a book. *Go back.* When Socrates was asked what he thought of the theories of Heraclitus? he replied, that "what he understood of them he found so clever, that he concluded what he did not understand was so likewise." *There* is a precedent for all philosophers. At any rate, he did not condemn what he did not comprehend.

In a former number of your Magazine, my attention was drawn to the subject of the growth of trees. Is it attraction that lifts those enormous masses above the earth? Yes—capillary attraction! What *is* capillary attraction? Something very different from any account of it that I have as yet seen, or I am much mistaken. Of this at another opportunity.

I remain, Sir, your obliged, &c.,

E. A. M.

January 15, 1842.

* See *Mech. Mag.*, vol. xxxiv. and xxxv.

MR. PILBROW'S CONDENSING ENGINE.

Sir,—As Mr. Pilbrow has invited discussion on the merits of his condensing engine, I beg to offer a few observations on that part of it which appears to me most open to objection.

Mr. P., I think, overrates, in the first place, the perfectness of his vacuum as compared with that of the common engine. He says, speaking of the condenser of the common engine, that "all air and gas cannot be withdrawn at each stroke of the air-pump; half, at least, must remain in the separate condenser, which will expand and make the extreme vacuum less by 1lb." One might almost be led from this to suppose, that Mr. P. meant to say that all the air and gas given out *in the last condensement* cannot be withdrawn at one stroke of the air-pump, but that a portion of it remains to vitiate the vacuum. But what must be the inevitable result, if such were the case? Certainly this, that the air-pump being unable to withdraw *all* the air and gas given out at each condensement, that portion which is not so withdrawn, or remains behind in the condenser, must *continue to accumulate* until the vacuum become thoroughly vitiated. Mr. P. must perceive that such must be the result on the supposition stated; but as no such incremental accumulation of gases takes place in the condenser of the common engine, it follows that the air-pump does in fact withdraw all the air and gases given out in each condensement. A certain portion of air or gas no doubt always remains in the condenser, arising from the unlimited expansibility of gaseous bodies, and the consequent impossibility of any air-pump, however perfect, *completely* extracting it from a chamber which its own piston does not fill, and in which, therefore, it will find room to expand. It may, however, be attenuated to a certain point, and there is nothing in theory or practice, except in as far as arises from imperfection in construction, to prevent the air-pump of the common engine maintaining the vacuum at that limit. As the piston of Mr. P.'s condenser fills or traverses the whole internal space or chamber, it certainly expels every portion of air or gas from within, and his condenser is therefore free from the imperfection just adverted to in the condenser of the common engine; but it does not necessarily follow that in practice he obtains a better vacuum than that of the common engine; for there is another consideration to be taken into ac-

count, namely, the difference in size or capacity between the two condensers, and whether the vacuum in his *comparatively* small condenser may not be as much vitiated at the end of each condensement as that of the common condenser, which is not limited in capacity like Mr. P.'s. Take the state of the two condensers at the end of one condensement; and just before the engine makes a new stroke. The vacuum of the common condenser is vitiated by the gases given out during the condensement just concluded, the vapour due to the temperature of the condensements, and that *constant* portion of gas which the air-pump cannot withdraw; but then these are diffused in a large space or chamber. In Mr. P.'s condenser—the vacuum is vitiated in like manner by the gases given out during the condensement just finished, and by the vapour due to the temperature of the condensements—being free, however, from the *constant* portion of gas of the common condenser; but then they are cooped up and confined in a small or limited space; and it may be worth inquiring whether, under these circumstances, their elasticity, or power of offering resistance to the piston of the engine, is not as great as in the common condenser, or, in other words, whether in practice his vacuum is at all more perfect than that of the common condenser.

The main objection, however, to Mr. P.'s engine, and which will more than counterbalance any advantages it may have in other respects over the common engine, is, the enormous resistance to which it is subjected, *towards the end of each stroke*, by the pressure of the atmosphere on such a large surface as the area of the condenser piston—a resistance which, added to the work performing by the engine, may well nigh go to stagger and paralyze its movement. I am unable to perceive the soundness of Mr. P.'s reasoning on this point. He says, "No enormous burden thrown on my engine, not an ounce, whether the condensement is thrown out by a large area of piston and a short period of discharge, (as in my engine,) or by a small area of piston and a long period of discharge, (as in the present engine,) the total effect of the pressure of the atmosphere must be the same, the quantities being, as they will be, equal." In what respect are the quantities equal? The air-pump of the common engine is made of definite proportions, to effect a definite end—the expulsion of the gases and water which are found in the condenser at the end of each condensement; and that proportion is given to it which is just suitable to produce the result intended, and not more. The size of Mr. P.'s air-pump, or the area of his condenser piston, (which is the same thing,) is not made with reference, *primarily and only*, to the purpose of ejecting the gases and water resulting from each condensement, nor has it those proportions which would be given to it, if it had merely that end to fulfil. I cannot acquiesce in Mr. P.'s reasoning, that a large area of piston and short period of discharge necessarily come to the same thing as a small area and a long period of discharge, which is the inference deducible from his words in the quotation I have given. Enlarging the area of the piston does indeed defer and shorten the period of discharge; but, however much the area may be enlarged, a time must come, *though it be at the very end of the stroke*,* when the condensements must be discharged, and the pressure of the atmosphere let in on the piston: yet I can hardly think that Mr. P. will assert that the total amount of pressure on the piston is still the same.

There are two things which, it appears to me, Mr. P. has not satisfactorily proved, and I submit them to his candid consideration.

1. That the total amount of pressure or resistance from the atmosphere on his condenser piston is the same as, or not greater than, the resistance of the same fluid on the piston of the air-pump of the common engine—the steam cylinders of both engines being in all respects alike.

2. Supposing the amount of pressure of the atmosphere to be the same in both, whether the accumulation of this resistance at the end of the stroke, *when the crank is in the worst possible position to carry on the movement of the engine*, is not far more prejudicial to its effective working, than the same resistance diffused over the whole, or a considerable portion of the stroke.

N. N. L.

January, 1842.

MECHANICAL CHIMNEY SWEEPING.

Sir,—Public attention has been very properly directed to a somewhat important matter in connexion with the forthcoming emancipation of the "little negroes of our own growth," by the notice which appeared at page 425 of your last volume.

The change which will then be *complete*, has already to a great extent taken place; *machines* are now become common, *children* scarce. Thanks to the indefatigable exertions of Mr. Stevens, and his humane coadjutors.

Lest the compulsory humanity which is now thrust upon us, should be productive of needless annoyance, I beg to add a few words for the guidance of housekeepers, on a point upon which they are open to deception.

There are at this time in use two kinds of machines for sweeping chimneys, known as Smart's and Glass's. The former consists of a number of short *inelastic* hollow rods fitting loosely one into the other, and connected by a rope passing through the whole. *Never employ any person who uses this machine.*

Glass's machine—which is sanctioned by parliament, and is the machine by which the perfect and efficient sweeping of chimneys by mechanical means was completely established—consists of a number of *elastic* bamboos firmly connected together by screwed ferule joints.* This machine is sufficiently pliable to sweep all ordinary chimneys, and with a little contrivance, every chimney in existence; while its firmness and stability enable the user to cleanse the chimney more effectually than boys have ever done.

Glass's, at present, is the only machine that can be depended upon; when chimneys require sweeping, therefore, see that this machine is employed: it differs so greatly from the other that there can be no mistake, and housekeepers may depend upon it, that those parties who will still continue to use the old inefficient machines, only do so for the purpose of causing annoyance and bringing mechanical chimney sweeping into disrepute, by showing how very badly chimneys can be swept by a bad machine, worked in the worst possible manner.

A slight attention to these points will ensure the efficient and cleanly execution of what has heretofore been very imperfectly accomplished by a very barbarous method.

I am, Sir,
Your obedient servant,
Wm. Baddeley.

January 3, 1842.

* Described with illustrated engravings, at page 184 of vol. ix.

BLASTING ROCKS UNDER WATER BY GALVANIC IGNITION.—IMPROVED APPARATUS INVENTED BY DR. HARE.

[From the Franklin Journal.]

In Vol. xii. of the last series of this Journal, (page 221,*) we published an article by Professor Hare, describing an apparatus for the blasting of rocks by means of galvanic ignition; and it will be seen, by the subjoined letter, that Captain Paris, a well-known engineer and architect, of Boston, has applied the proposed means, with perfect success, in blasting rocks under water. In the article by Dr. Hare, Mr. Moses Shaw, of Nova Scotia, is mentioned as having first suggested the idea of igniting the powder in blasting rocks, by the aid of the electric fluid. That gentleman had pursued the subject with much persevering industry, contending, at the same time, against pecuniary difficulties, and a want of those resources which science alone can supply, in the prosecution of such undertakings. He well merits, however, to have his name associated with those who have brought the matter to a successful issue.—Editor.

Dear Sir,—Knowing the great interest you have always manifested in all engineering operations connected with the construction of public works, it affords me pleasure to communicate to you an account of the transactions within the past summer at this Navy-yard, in blasting rocks under water by means of the galvanic battery.

The application of this means to purposes of blasting is somewhat novel, as you are well aware, and the account of Colonel Pasley's experiments in England has given to the public the first notice of its being thus employed. Since the blowing up of the wreck of the Royal George, it has been successfully used in England in blasting rocks and clearing harbours, rivers, &c. from obstructions: it bids fair to entirely supersede the old methods of blasting, both in civil and military operations, especially in the latter, where it becomes a tremendous agent for the instantaneous explosion of mines, &c.

* September, 1833.

In the detailed accounts of the experiments tried by Col. Pasley, it appears that at first many difficulties were encountered; and the numerous failures seemed to forbid any hope of success in large operations, although the result of those on a smaller scale generally proved satisfactory. Perseverance, however, enabled the operators, after many trials, to render the explosion of the charge under water as certain as by the ordinary methods on dry land; and the subsequent success in blowing up sunken wrecks, &c., at the bottom of the Medway river, and at Spithead, proved the utility of the means, and amply compensated for the labour and expense incurred in the first attempts.

Our operations during the past season were confined chiefly to the construction of quay walls and the foundations of two launching ways, the whole of which were built of stone. The character of the bottom of the river where the work was laid rendered blasting or other means necessary, before a proper surface for the foundation could be obtained; it was desirable to give it a slight inclination inwards, so that the face of each course of stone should lie somewhat higher than the inside, thus preserving a proper batter of the walls, and rendering them perfectly secure. This bottom is a hard slate rock, and, with the exception of some level portions, extremely uneven, with slopes of almost every grade, generally in an outward direction from the shore. The depth of water in the line of the walls varies from fifteen to twenty feet at low water, and from twenty-five to thirty below the high tides. This depth of water, added to a strong and variable current, caused me to anticipate much difficulty and great expense in all operations below its surface.

But we were, fortunately, provided with a fine diving apparatus, consisting of a cast-iron diving-bell, and a powerful air-pump attached. This apparatus was worked from a vessel of strong construction and light draught, fitted expressly for the purpose. A system of signals and messengers was established for communication between the workmen in the bell and those on board the vessel; by these means every want was speedily made known and answered. Four workmen, divided in two gangs, were employed for working in the bell, which made four descents per day, occupying at each time two and a half hours, the two gangs alternately relieving each other. The bell was amply supplied with a constant stream of fresh air, and but two or three inches of water remained in it at its greatest depth, so that the men worked in a comfortable state, perfectly dry, and with no more difficulty of respiration than on dry land.

In deciding upon the best means for preparing the bottom for the reception of the foundation of the walls, I was greatly at loss which to adopt. It appeared to me, that in adopting the method practised by Col. Pasley, great expense and difficulty would be incurred; and as it did not appear that this method had been employed in blasting the solid rock at the bottom of a river, in any of his experiments, I was somewhat apprehensive of its utility for operations of this kind, and whether the cost would justify the trial. In order to satisfy myself with regard to the expense of an experiment with the galvanic battery, I applied to Mr. Daniel Davies, junior, philosophical instrument maker, of Boston, for the necessary information, when I was convinced that a very trifling expense would procure such a trial as would satisfactorily decide the merits of the apparatus. Mr. Davis kindly assisted me in making the experiments which were tried at the Navy-yard at Charlestown, and I had the pleasure of witnessing the most satisfactory results, and without hesitation determined to apply the means to the work in hand.

The galvanic battery, which was constructed by Mr. Davis, was one of Dr. Hare's invention, of Philadelphia. It consists of two vessels or jars, each formed by two concentric cylinders of copper, admitting of a cylinder of zinc between. Two copper wires, termed the conducting wires, formed the medium by which the electrical fluid was communicated to the charge from the battery. These wires were closely wound with thread, in order to prevent their coming in contact with each other, and both tightly covered with tape, and afterwards served round with twine, thus forming a single coil. At each extremity of the coil the wires were separated for a few inches, like a fork. This form of the galvanic battery, termed by Dr. Hare, the "Calorimoter," is the most simple and portable of any that I have seen; its power for blasting gunpowder may be increased to any required degree, either by enlarging the size of the jars, or increasing their number. We had, in addition to this apparatus, a simple contrivance for proving the charges of powder, which is termed the "Electrometer."

The charges used in blasting consisted of various quantities of gunpowder, according to the effect required, from four ounces to a pound. They were enclosed in perfectly air-tight tin cannisters, the smallest being an inch and a quarter in diameter, and the diameter of the largest about two inches; the lengths of the cannisters were eight or nine inches. Two copper wires were introduced into the cannister, about half-way down, with the extremities connected by a fine platinum wire; the other ends of the wires pro-

jected twenty or twenty-five inches beyond the mouth of the cannister, which, after being filled with powder, was closed, and effectually secured with a water-proof composition. It will be observed, in thus preparing the charges, that the whole is completely air and water tight, and that no vent to the powder remains, an advantage of which I shall further speak.

The operation of blasting is carried on in the following manner. The hole in the rock for the reception of the charge is drilled to a proper depth by the workmen in the bell; the cannister is then inserted, with the ends of the copper wires extending outside of the hole, which is then filled up or tamped with coarse sand. The ends of the conducting wires are then connected, by means of clamps, to the wires leading from the charge; the other end of the coil is then led up, as the bell is hoisted to the surface, to the battery, which, in all our experiments, was placed on a floating stage directly over the charge. The jars forming the battery are brought near each other, and their whole power concentrated by connecting them together with a short copper wire; the end of one of the conducting wires is then brought in contact with one pole of the battery, and the end of the remaining wire similarly disposed with the other pole, when the explosion instantly follows, by the platinum wire in the charge becoming intensely heated as the electrical current passes through the conducting wires.

We made during the past season nine blasts, with but one failure, which was caused by the platinum wire in the charge becoming accidentally broken, so as to render the electrical circle incomplete; this probably occurred in tamping, an operation which must be conducted with care, as this accident is most liable to be incurred, of all others, owing to the extreme delicacy of the wire. The object of the electrometer is to detect whether this has taken place before the charge is inserted in the rock, and may always be ascertained by a simple trial.

It must be obvious to every one, at all experienced in blasting rocks, that this method has advantages, in many respects, over the old methods, both under and out of water. The danger of accidental explosions is entirely prevented; these occur, for the most part, in the old practice, by carelessness, while in this, great care and nicety are required to produce the explosion. There is very little time required in charging, as the cannister is simply inserted in the hole, and tamped with sand; the whole time occupied in this operation, and making the connexion with the conducting wires, in the present cases, rarely exceeded twenty minutes. There is great expense and trouble saved in the absence of the train or fuse, which was indispensable in the old methods, especially under water, where was always required a water-tight hose or tube leading to the surface, which was always destroyed by the explosion. Here nothing is lost or injured, except the cannister containing the charge. The explosion of the charge is reduced almost to certainty, and should cases of failure occur, it can be approached with safety, without the suspicion that fire may be near it. The most important advantage, in an economical view, is, that the effect of the charges is much greater than in the old way, in consequence of there being no vent-hole; the whole explosive force of the powder is thus gained, while by the old methods much of it is lost. Our smallest charges displaced a much greater quantity of rock than the same amount of powder by the old means, which we had opportunities of experiencing. With these advantages, this method of blasting places in our hands the most ample means of clearing harbours and rivers of rocks, &c. in any reasonable depth of water.

In using Dr. Hare's apparatus, it appeared that an important advantage was gained over that of Professor Daniell's, employed by Col. Pasley, inasmuch as a very troublesome arrangement, indispensable in the latter, was avoided. This consisted in not being obliged to insulate the conducting wires from the water, as in such a case the connexion of the conducting wires with the charge must be made before the cannisters are placed in the rock; every portion, then, of the wires where the connexion is made must be covered with the waterproof composition. By Professor Daniell's apparatus, it appeared that water was a conductor, thus destroying the electrical circle, if any part of the conducting wires came in contact with it.

Though Dr. Hare's battery was known to Col. Pasley, it was not adopted in his experiments, the reason assigned being that "it did not appear that he had ever used it under water."

I have the honour, Sir, to be,

Your obedient servant,

ALEXANDER PARIS, C. E.

Col. S. Thayer, Boston.

Navy-yard, Portsmouth, N. H., Nov. 9, 1840.

BRIGHTON BREAKWATER AND HARBOUR OF REFUGE.

We lately inserted a description of Captain Tayler's Floating Breakwater, as proposed to be applied at Brighton, (No. 952, for November, 1841). We have been since favoured with a copy of an Address by our esteemed correspondent, Mr. G. A. Wigney, to his

"Fellow Townsmen," in which he lays before them the plan of a *solid* breakwater, of a peculiar construction, which he has invented, and the adoption of which he advocates with his usual ability, as offering many advantages which no *floating* breakwater can ever possess. Mr. Wigney, referring to a Public Meeting held at Brighton to consider of Captain Tayler's plan, thus explains the circumstances which led to the origination of his own.

"Subsequent to the meeting, and in the afternoon of the same day, I was informed by a person of the substance of what had transpired, accompanied with the observation:—'How much better it would be to have a solid breakwater.' In reply to such observation, I stated that, being without a supply of stone in the neighbourhood, the construction of a solid breakwater was out of the question, and that in those places where an abundant supply could be commanded, the enormous cost of construction was almost an insuperable barrier to its accomplishment. But while conversing on the subject, it occurred to me, that the formation of one with cast-iron plates, filled with concrete, was not only practicable, but that its cost of construction, and superior adaptation for the purpose, rendered it a subject well worth consideration and inquiry; and having communicated the idea to the person with whom I was talking, I left with a determination to pursue the subject yet further."

* * * *

Mr. Wigney then mentions other circumstances connected with the maturing of his plan, and thus proceeds to describe it more in detail.

"*As a Structure*, it will be composed of, (comparatively speaking,) indestructible materials,—of cast-iron plates, coated with gas tar, well united by bolts, and rendered impervious to water; capable of replacement, if ever worn out, and filled with concrete increasing annually in durability, of such an enormous weight, as will render its stability secure, I conceive, against the most violent storms, and to which an indubitable security may be added by piles and moorings, should any doubt prevail as to its safety without. And to prevent the possibility of any accumulation of sand, gravel, or other obstruction, either to the entrance or elsewhere, the arched caissons allowing a clear run of ten feet of water beneath will obviate every such liability.

"*As a Harbour of Refuge*, it furnishes an entrance from the east, and another from the west, of requisite breadth, with twenty-six feet depth of water at low tide, and therefore admissible to vessels of the greatest burthen. The southern breakwater will furnish a light-house in the centre, 100 feet in height, or 55 in height above the highest spring tides. The eastern and western towers of such breakwater, and the southern towers of the eastern and western breakwaters, will furnish lights to direct vessels to each entrance.

"*As a Protective Harbour*, it will furnish, from the entrance to the interior, water gradually diminishing from the turbulence of the tempest to the stillness of a calm; and the addition of an inner breakwater may at any time be made, to increase the security of the shipping within, should such a measure ever be deemed necessary. At the highest spring tides, each tower will present a barrier to the waves fifteen feet in height above the level of the sea, and the intermediate caissons a rampart of ten feet.

"*As a Fortified Harbour, and an Armed Line of Defence for the Town in time of War*, I conceive that this structure is admirably adapted; as each tower, with the light-house, being mounted with one gun, will furnish a southern crescent battery of thirty-seven guns, and an eastern and western battery of eighteen guns each, which may be of sufficient reach to cover the whole town from east to west; affording not only a certain and instantaneous protection to the shipping within its precincts, and to the magnificent property which so splendidly adorns the sea-girt borders of your town, but also a safe and peaceful residence and resort, in time of war, to those residents and visitors whose support is indispensably necessary to your welfare and prosperity.

"*As a Panoramic Exhibition of Marine Scenery*, the imagination alone can furnish data for a description of the reality. Vessels of war, steam-packets, regatta yachts, ships of merchandise, boats for fishing, and skiffs for pleasure, will constitute the pleasing group that must delight the eye of every gazer.

"*As a Protective Girdle to the Chain Pier*, which beautiful structure is shown in its centre, the security which it will furnish will be effective and complete, and the embarkation from its platform at all times safe and pleasant.

"*As an additional and more extensive Promenade* than is now furnished by the Chain Pier, the iron ramparts on the eastern and the western side will present a continuous road-way, 12 feet in width, and nearly 3,000 feet in length; and at the end of each, a flight of steps will enable the pedestrian to pass, by boat or floating-bridge, the harbour's mouth; and ascending the southern breakwater, he may extend his walk a further distance of above 3,000 feet,

and making his return by the opposite course to that on which he commenced his tour, he will, on reaching the shore, have enjoyed all the exquisite pleasures attendant on the circuit of about 10,000 feet in distance.

"*As a Mercantile Harbour*, although we happily do not at present need one, and its appropriation for the purpose might be injurious to the welfare of the town, and prove inimical to the interests of the proprietors of Shoreham harbour and the Railway Company, which (for one) I consider we are in justice bound not to oppose, but on the contrary to support; yet should any fortuitous circumstances ever require its use for such a purpose, it will at all times be a source of pleasure to reflect that you have the means of availing yourself of its resources for the purpose, and having devised means for the transmission of the merchandise unshipped to one or more unobjectionable situations without interfering with the marine drive, the greatest objection to its use as a mercantile harbour may thereby be obviated; and I beg leave to take the liberty to suggest, that in justice to the Chain Pier Company, the use of the breakwaters as a promenade should be a subject of pecuniary arrangement with them, and which, I conceive, it would be to the interest of both parties to endeavour to effect.

"*As a Protective Harbour to Fishermen*, the cause of humanity, the welfare of a class so numerous and interesting, and the pecuniary interests of the rate-payers are powerful inducements to provide them a haven so beneficial in the hour of danger, so stimulative to habits of industry, from a consciousness on their parts of being able to pursue their calling in dangerous (yet for their purpose the most propitious) weather, having a port of refuge to fly to, from the eastern, western, and southern quarters, in every case of imminent peril.

"Having enumerated, I trust, a sufficient amount of advantages to stimulate you to the endeavour to obtain them, I hope I shall stand excused from entering into a detail of many others that reveal themselves in prospective, and for passing on to

"*The Estimate*, which, with the able assistance of several competent persons I have been able to arrive at the amount, as well as the insufficiency of data on a work of so novel and peculiar a character will admit; and having made an ample allowance for contingencies, I feel warranted in stating that, I think, the amount will be considerably under 200,000*l.*, one-third of which will be payable for manual labour, a circumstance very far from being unimportant to all those who are interested in the employment of the labouring classes.

"*The Testing of the Principle.*—The dictates of prudence naturally prompt the suggestion, that in case it should be deemed desirable by my fellow-townsmen that so important and great an undertaking should be accomplished, that in the first instance a sufficient number of eminent engineers and competent nautical judges should be consulted as to the probability of the realization of the anticipated advantages, and the practicability of carrying the work into effect; and to facilitate such inquiry, I beg to refer you to the perspective drawing and model which I have caused to be made, and which may be publicly seen at the Town Hall. Should their report be favourable, I beg to submit the suggestion that a subscription should be endeavoured to be raised for the purpose of providing and placing in their designed situations the lighthouse of the southern breakwater, the two adjoining towers, and the two intermediate caissons, as shown by the model, in the following spring and summer, and allow the succeeding winter to pass over in order to test the principle fairly, to ascertain if any improvement can be made in the principle or mode of construction, and to furnish the requisite experience which it may be desirable to obtain, preparatory to the execution of the work to the extent of completion.

"To ascertain the necessary amount to perform this experimental portion of the work, there are the same difficulties in the way as have occurred in making out the estimate for the whole; and as the execution of this minor portion will require nearly all those erections and subsidiary expenses as would be necessary to accomplish the whole, so therefore must the estimate for such portion much exceed the proportionate amount that would be incurred by its execution with the rest. But as such erections will serve their required purpose in ultimately completing the work, such an outlay will not be finally lost, provided it is deemed desirable to finish it. The amount requisite to carry into effect this experimental test, I have reason to believe will not exceed 7000*l.*; but I should suggest that 8000*l.*, in 5*l.* shares, be raised, and that such shares should become available, in case it should ultimately be deemed desirable to form a company for the completion of the work, of which the original shareholders would form the nucleus.

"*The Execution of the Work.*—That in the accomplishment of a work of such magnitude and novelty, many unforeseen difficulties may occur in addition to those which have been already anticipated and mentally provided for, there can be but little doubt; but let them be what they may, I feel assured that in the present day, abounding with so many stupendous and successfully executed projects, that sufficient engineering

talent can readily be procured to meet, remove, and overcome any that may possibly be presented. And while from the nature of my engagements and avocations I must necessarily decline any participation in its accomplishment, should any such expectation be entertained in consequence of my being the projector, yet I shall feel pleasure in communicating at my leisure opportunities to those you may select (should you determine so to do) to inquire into the merits of the invention, the practicability of its execution, and the advantageous prospects which its performance may offer, the several modes, means, and resources which I have devised for its commencement and completion; and should the result of my appeal to you cause the adoption of the plan, the endeavour to carry it into effect, and the appointment of a competent person to accomplish the work, I shall feel pleasure in rendering him assistance as my leisure may permit, and offering him such suggestions as it may be in my power to furnish, should they be required."

DAVIES'S ELLIPTOGRAPH.

(Registered pursuant to Act of Parliament.)

Fig. 2.

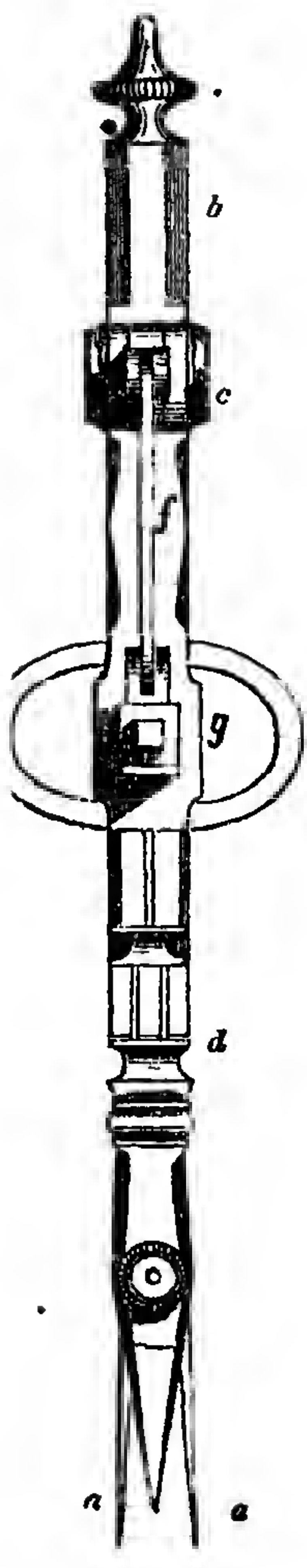
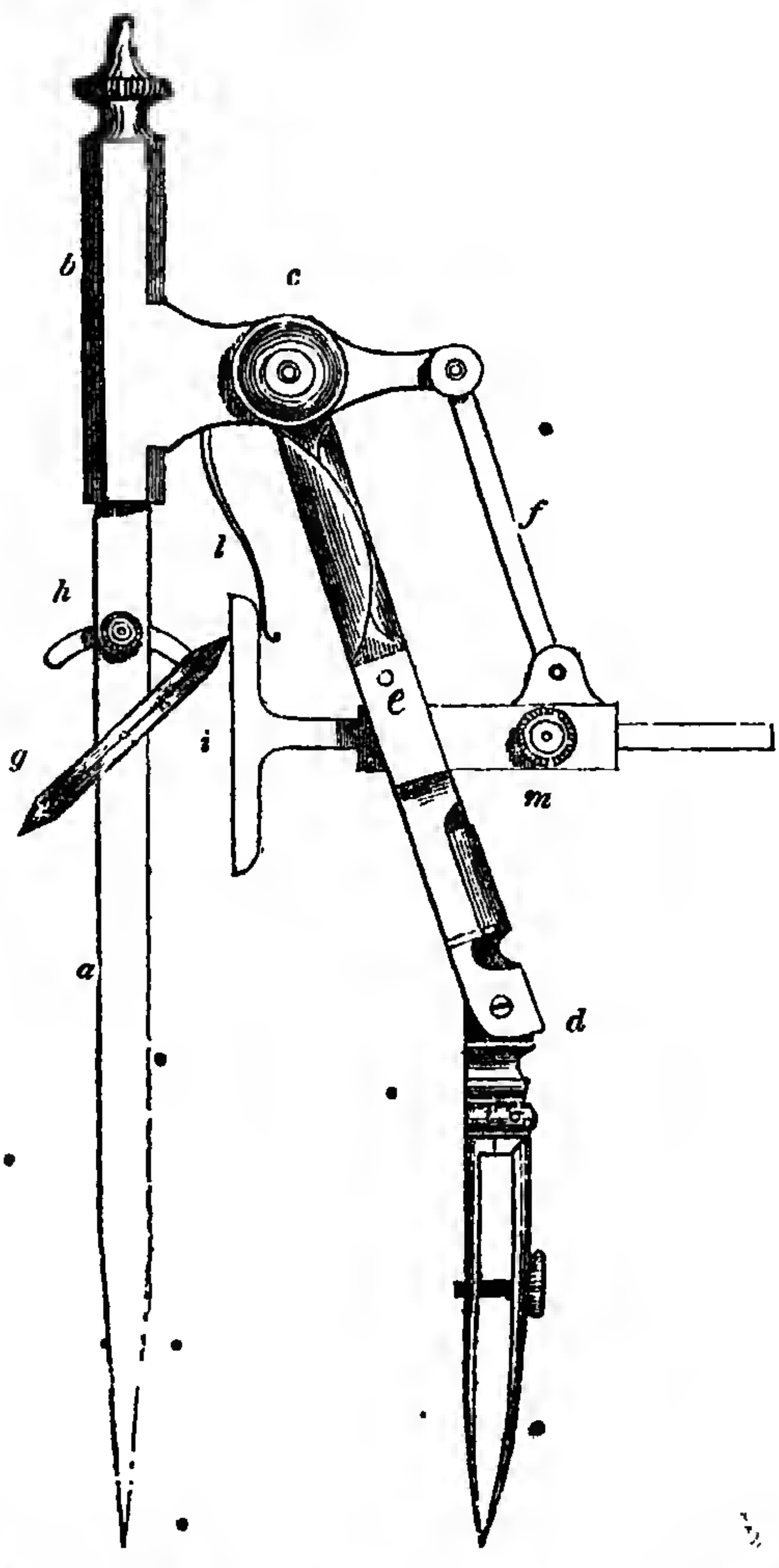


Fig. 1.



Mechanical draughtsmen have long required the assistance of some simple instrument which should, without any previous complicated adjustment, enable

them at once to strike the ellipses, which would correctly represent the perspective of wheels and other circles.

Such an instrument has been designed by Mr. Henry Davies, already well known as the author of several other useful and highly important inventions, and we have much pleasure in adding to the list, that which is represented in the prefixed engraving.

This ingenious little instrument consists of an upright stem or axis, which terminates at its lower end in two points *a a*, to give it the required stability in a perfectly vertical position. On the upper part of this axis a compass head *b* revolves, having attached to it, by a joint at *c*, the pen or compass limb *c d*. A square horizontal shaft is jointed into the latter at *e*, and maintained in its position by the parallel rod *f*. Upon the central shaft or axis *a*, there is pivoted a circular steel plate with bevilled edges *g*, which may be set at any required angle to the horizon by the quadrant and set screw *h*. A T-shaped guide *i*, has its longer stem *k* passed through the horizontal shaft, and held by the set screw *m*; the face of the guide *i* is constantly kept in close contact with the edge of the circular disc *g*, by means of a small spring *l*.

A glance at this arrangement will almost suffice to show its operation; suppose, in the first place, that the disc *i* is set perfectly horizontal, and the instrument applied to describe a figure upon paper; on turning round the compass limb and pen *c d*, a transcript of the disc *g*, that is, a circle will be delineated, because the pen has been guided round it in a circular path by the spring *l*. Let the disc *g*, be now set at any angle, say 45°, and the instrument applied to paper and turned round; the pen will again be guided round the disc *g*, but no longer in a circular path; an ellipse will be described, which will be the correct perspective of a wheel or circle viewed at an angle of 45°; and so of circles viewed at any other angles, of a size within the powers of the instrument.

The set screw *m* allows the compass to be set to the size of the circle required; at the same time the guide *i* is always maintained in contact with the disc.

We hope and trust that this convenient and ingenious little instrument will be speedily brought before the public, in a form, and at a price, that will enable all parties to avail themselves of its important advantages.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

*** *Patentees desirous of fuller abstracts of their Specifications than the present regulations of the Registration Offices will admit of our giving, are requested to favour us with the loan of their Specifications for that purpose.*

GEORGE HENRY PHIPPS, OF DEPTFORD, ENGINEER, *for improvements in the construction of wheels for railway and other carriages.* Enrolment Office, January 1st, 1842.

The object of these improvements is to avoid the injurious effects of heating the tyre in the ordinary process of "shrinking on," by superseding that process. For that purpose the patentee proposes to construct a railway wheel in the following manner. A bar of wrought iron, is prepared of a proper form by rolling, in the usual manner, with an outer flange at one edge, and an inner flange in the centre of the bar; this bar is bent into a circular form and welded. A suitable number of wrought iron spokes (sixteen) are prepared, with an extended end or palm, which may be drawn out by hammering, or may be welded on; the inner end of each spoke is jagged, or perforated, in order that the cast metal may embrace and hold it fast. Eight of these spokes are then laid in a mould, and one portion of the boss or nave of iron, cast upon their inner ends; the other eight spokes have the corresponding portion of the boss or nave cast upon them. The two parts of the nave are then brought together, and secured by screw bolts, and the enlarged ends or palms of the spokes strongly secured to the alternate sides of the inner flange by screw bolts, or by riveting. Another method consists in placing all the spokes in their respective positions around the wheel, and casting the boss or nave in one piece; the palms of the spokes being afterwards riveted to the inner flange. In the wheels thus constructed, the position and appearance of the spokes strongly resemble the suspension wheels of Messrs. Jones and Co.; but the patentee also proposes to construct wheels on the foregoing principle with a single row of spokes lying in the same plane. Wheels for common road carriages may also be similarly constructed, by omitting the outer flange, which is essential to the wheels of railway carriages.

The claim is, to the construction of a wheel with a cast iron boss or nave, with wrought iron arms or spokes cast in it: the arms or spokes being attached to the wrought iron tyre by riveting or bolting.

George Onions, of High-street, Shoreditch, Engineer, *for improved wheels and rails for railroad purposes.* Enrolment Office, January 7, 1842.

This invention of improved wheels for railroad purposes consists in casting such wheels, of iron made from Cumberland or Lancashire ores, which is afterwards made malleable by annealing, and subsequently case-hardened. The improvements in rails for railroad purposes consist of an arched base, manufactured of common cast-irod, with a groove running along the centre thereof, and into which groove a rail, made of iron cast from Cumberland or Lancashire ore, and afterwards annealed, is affixed. Such base is to be made either singly or doubly—if doubly, by connecting surfaces of iron.

The claim is, 1. To the casting of wheels, for railway purposes, of iron made from Cumberland or Lancashire ore, afterwards made malleable by annealing, and case-hardened; 2. As well the mode of constructing bases, as casting the rail of iron made from Cumberland or Lancashire ore, and made malleable by annealing.

Thomas Young, of Queen-street, London, Merchant, *for improvements in lamps.* Enrolment Office, January 8, 1842.

The first of these improvements, which are eight in number, relates to hand lamps with small argand burners, and consists in the application of fine wire gauge or perforated metal plates, through which the air is admitted, so as to prevent the flame being affected by a rush of air while in rapid motion. The second improvement consists in the application of tubes to an argand lamp, by means of which a supply of air is carried down from above to supply the passage through and around the burner. The third improvement consists in a mode of attaching carriage lamps, so that they draw their supply of air from within the carriage, thereby ventilating the same; at the same time preserving their perpendicular position without being in any way affected by the inclination or motion of the carriage. The fourth improvement relates to ship's lamps, the stem of which is composed of a number of sliding telescope tubes, so as to admit the lamp to be set at any required and admissible height, while the lower tube, or socket, fits into a cylindrical hole in the centre of a weight of a hemispherical form, which is supported flush with the surface of the table, &c. upon gimbals. The fifth improvement consists in a mode of applying a metal plate or deflecting surface within the glass chimney, having a large hole in its centre, and a number of smaller holes around its inner edge for regulating the supply of air around the flame. The sixth improvement consists in the introduction of air intermediately of the length of the chimney, by means of perforations in the glass chimney, or by making the glass chimney in two or more parts, and introducing the air at the joints. The seventh improvement consists in making the glass chimneys of lamps in two parts, and applying a deflecting plate between them, or by forming the plate on one of the parts of such chimneys. The eighth improvement consists in a provision for raising or lowering the glass chimney, so as to adjust it to the most advantageous height for obtaining the best kind of flame; this is effected in one case, by making the gallery in two parts, one of which screws up or down within the other.

The claim is—1. To the mode of making hand lamps; also the mode of applying woven wire surfaces to argand lamps.

2. To the mode of conducting air from above into the interior of an argand burner.

3. To the mode of supplying carriage lamps with air from within the carriage, and so arranging the parts as to retain the lamp in a vertical position.

4. To the mode of retaining the lamp in a vertical position at sea, by applying the apparatus above described to a table or other fixed surface.

5. To the mode of applying a plate or surface within the glass chimney of lamps by suspending the plate from above.

6. To the introduction of air intermediate of the length of the chimney, by applying perforated chimneys—or chimneys made of two or more parts.

7. To the making of chimneys of two parts, and applying a plate between them, or forming the plate on one of the parts of the chimney.

8. To the mode described of regulating the height of the chimney and plate.

Charles Payne, of South Lambeth, Chemist, *for improvements in preserving vegetable matters where metallic and earthy solutions are employed.* Enrolment Office, January 8, 1842.

These improvements consist in impregnating the vegetable matters to be preserved with any suitable metallic or earthy solution, and afterwards decomposing the same, thereby precipitating the insoluble substance so formed, in the substance of the preserved matter. Thus, for instance, a piece of wood which is to be preserved by this process, is placed in a suitable vessel and a vacuum produced therein by an air pump, or by any other convenient means. A strong solution of sulphate of iron is then admitted, which enters

into the interstices of the wood; when saturated, the wood is either, in its wet state, or after being dried, treated with a carbonated alkali, (carbonate of soda being preferred) by which the salt of iron is decomposed, and becomes converted into an insoluble precipitate within the substance of the wood. The saturation of the wood may be assisted by pressure or not, as found to be best.

Another process consists in the employment, in like manner, of a solution of alum, the decomposition of which is also to be effected by the same agent as before—carbonate of soda. The patentee observes, that the processes of injection, by vacuum and compression, as well as the employment of metallic and earthy solutions, have before been applied to effect the object in view, the mere use of which he disclaims; but what he claims is, the mode of preserving woods and other vegetable substances, by causing them to be impregnated with a solution of metallic or earthy matters, and then by chemical decomposition to retain the matters employed, in an insoluble state, in the substance of the vegetable matter, when such effects are obtained by the combined processes of exhaustion, compression, and decomposition, as above described.

Moses Poole, of Lincoln's Inn, Gentleman, *for improvements in steam baths and other baths.* (A communication,) Enrolment Office, January 13th, 1842.

A room is constructed in a steam-tight manner, by being lined with sheets of lead or zinc; on one side, near the floor, there is an opening, furnished with shutters, by which the admission of atmospheric air can be regulated at pleasure, while on the opposite side of the room, near the top, another opening, similarly fitted, is placed for the escape of the impure heated air and steam. Light is admitted at the top by a double sky-light. A boiler (of copper is preferred) is furnished with a safety-valve, and also an apparatus for supplying it with filtered soft water. Steam is generated in this boiler under a pressure of from 10 to 20 lbs. upon the inch, for the purpose of supplying steam to the bath, and also for heating a quantity of water contained in an elevated cistern. Another elevated cistern contains a supply of cold water. Within the room or bath there are three rose heads, one above the other, connected with the hot and cold water cisterns in such a manner, that by regulating the cocks, a shower of hot or cold water, or of any intermediate temperature, may be obtained from either of these rose heads; so that a person may apply a shower of cold water to the head, warm to the stomach, and hot to the feet. The mode of using this improved bath is as follows:—The bather, on entering the bath, prepares himself by first subjecting his body to the shower from one or more of the rose heads gradually increasing the temperature; steam is then gradually admitted, until the bath attains a temperature of 80° or 100°. The floor is of wood, perforated with a number of holes for the escape of the water from the rose heads, and provision is made for the bather to sit or lie down; flexible tubes are also attached to the steam pipes, by means of which jets of steam may be directed to any part of the body. The steam bath having been continued long enough, the hot shower bath is again resorted to, gradually decreasing the temperature till it approximates to that of the external atmosphere.

The claim is, 1. To the mode of producing a steam bath by the application of steam (generated under considerable pressure) within a room so arranged as to allow of a sufficient circulation of fresh atmospheric air, as above explained; 2. To the mode of combining the use of a high-pressure steam bath in a ventilated room, with a rain douche, or water bath, whereby the skin is prepared before and after a steam bath, as above explained; 3. The mode of regulating the temperature of douche baths, "whether rain or voluminous."

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal.*]

Improvement in Smelting Furnaces. *W. H. Phillips.* The patentee introduces the specification of this improvement with the following general remarks. "For the purpose of economizing fuel, it is a point of considerable importance to be able to use the waste heat for supplying the blast to the smelting-furnace, and this has been done in numerous instances, and under various modifications of the apparatus employed. It has been found, however, that in all cases the air so heated is subjected to great variation in its temperature, and that from causes incident to the employment of such furnaces, when dependence is had upon the waste heat alone to accomplish the intended purpose. Whatever produces a diminution of heat in the interior of the furnace must produce a corresponding effect in the air-heating apparatus, and that at a time when it is most desirable to keep up, or increase, the temperature of the hot blast, in order the more rapidly to restore the wanted temperature in the furnace. One of the most general causes of the temporary diminution of heat in the furnace is the introduction of the charges of coal, and flux. The quantity of gas emitted from the fuel also varies considerably, in different stages of its combustion, and with

it, of course, the quantity of flame in the heating apparatus; other sources of such variation of heat are well known to those conversant with the use of smelting-furnaces." This difficulty it is the object of the improvement now patented to obviate. The method adopted by the patentee is as follows. "On the sides of, or otherwise close to, the heating apparatus on the tunnel head, I place one, two, or more small furnaces, for the express purpose of heating a portion of air, which is to pass from them into the heating oven, and to co-mingle with that arising through the chimney of the smelting-furnace. To these auxiliary furnaces I make close-fitting doors, in order that no air shall pass into them, excepting that which is forced to pass through the burning fuel which they are to contain. Into the ash-pit of these auxiliary furnaces I introduce a pipe, through which air, either hot or cold, may be blown from any suitable part of the blowing apparatus, which, by passing through the ignited fuel, and thence directly into the heating-oven, may be made to communicate a very high degree of heat to the pipes contained therein; I, of course, regulate the supply of air to be blown into the heating-oven, and to pass from the blowing apparatus into the auxiliary furnaces, by means of cocks, valves, or dampers, applied in the ordinary way, which devices are well known to all machinists." The patentee adds, that when it is not requisite to employ the heat from the auxiliary furnace, or furnaces, by closing the valves in the passages leading into and from them, the contained fuel will merely remain ignited, scarcely undergoing any combustion, until urged by the blast.

Steam Engine Pistons, *C. F. Pike*. The nature of this invention consists in the use of cylindrical metallic wedges, within side of metallic rings when used for the packing of pistons, and without side of metallic rings when used for the packing of piston rods, or valve stems. "To enable others," says the patentee, "skilled in the art to make and use my invention, I will proceed to describe its construction and operation. I construct my packing for steam-engines, or other pistons, by making two rings of cast iron, or other metal, turned as large as the diameter of the cylinder, and so wide that the rings will just fill the space between the head and follower of the piston when ground together. I saw said rings open, so that they may expand to fill the cylinder. I make a cylindrical wedge as wide as the two rings afore-mentioned, the external diameter of which will just admit it to slide within the afore-mentioned two rings when they are placed in the cylinder. The internal diameter of said wedges being conical, and as much larger at one end than at the other, as may be deemed necessary, said wedges being cut longitudinally into four or more parts, so that each part may be forced out from the centre against the two rings afore-mentioned. I make another cylindrical wedge in the form of the frustrum of a cone, and about seven-tenths as long as the one last named, the external diameter and taper of which corresponds with, and fits into the internal diameter of the large end of the other, the thickness of which I make sufficient to admit of screws being tapped into it, to move it longitudinally on the barrel of the piston. To keep said wedge in its place, I put in four, or more, screws, with collars on them, to be let into the followers, two on one side, and two on the other. Two with the collars on the inside shove the wedge ahead, and the other two hold it, or draw it back. I construct my packing for piston rods, &c., by making two rings of brass, or other metal, of a diameter that will just admit them on the rod, and so wide as just to fill the space between the bottom, or the bushing, and the cap, when ground together, and of a thickness of about one-eighth of the diameter of the piston rod, which I cut open, and place on the rod, so as to break joints. I make a cylindrical wedge of a width and internal diameter, corresponding with the width and external diameter of the two rings afore-mentioned. I make said wedge thicker at one end than at the other, to give it the proper taper, and cut it longitudinally, into four, or more parts, so that each part may be forced in towards the centre against the two rings afore-mentioned. I make another cylindrical wedge about seven-tenths as wide as the last named, the internal diameter and taper of which corresponds with, and fits on the external diameter of the small end of the other. The thick end I make of a proper thickness to admit of four set screws, made in the same manner as described for the piston, the external diameter of which is the same as the internal diameter of the head, or stuffing box; I fit on a cap with set screws therein, to adjust the last named wedge, so as to keep the two rings snug to the rod."

Improvements in the Machinery for Making Rivets; *Oliver Edes and Andrew Holmes*. The claim refers throughout to the drawings, and could not be understood without them; we will therefore merely attempt to give a general idea of the improvements claimed.

The first improvement consists in the construction of the cutting apparatus, the dies of which are semi-circular, so that in the operation of cutting the wire shall not be

flattened, there being a standard, or gauge, against which the wire is forced by the operator, to regulate the length of the rivet. The second is in the combination of the moving cutter, which separates the blank from the rod, with a spring arm for "pinching, or nipping, the piece of wire separated by the cutters, and conveying it downwards to the aperture" of the leading apparatus; and also in the arrangement of parts which withdraw the arm above mentioned from the blank after it has been carried to the heading apparatus. The third is in the combination of levers, &c., for forcing, or pushing, out the rivet from the aperture, after the heading machinery has performed its office.

MOVEABLE LOADING MUZZLE FOR RIFLES; *Alvan Clark.* The object of this improvement is, to facilitate the loading of the rifle, and to preserve the calibre of precisely the same diameter to the very point of delivery of the ball, and this is to be effected by means of what the inventor calls a "moveable loading muzzle," which is put on to the end of the barrel for loading, and removed when the rifle is to be fired. The bore of this loading muzzle, where it meets the barrel, is of the same diameter with it, and is enlarged towards the mouth, so as to receive the ball with ease, and gradually prepare it to be received by the barrel. The rifling of the barrel and muzzle should correspond. The muzzle may be fitted on by means of pins projecting from it, and fitting into holes made for that purpose in the end of the barrel. The claim is confined to this device.

IMPROVEMENT IN STEAM BOILERS; *John Penniman.* We will merely quote the claim appended to the specification, as it gives a sufficiently clear idea of the improvement to bring it within the comprehension of any one, viz.:—"Having thus fully described the nature of my improvement, and the manner in which I carry the same into operation, what I claim therein as my invention, and desire to secure by letters patent, is, the placing a series of circulating tubes on the front plate of the boiler, in such a manner as that they shall, at their lower ends, communicate with the water in the lower part of the boiler, and at their upper ends with the water in said boiler a little below the water line, whilst they are, along their whole length, exposed to the direct action of the heat in the fire-box, in the manner, and for the purpose, above set forth."

In pointing out the effect produced by thus placing the tubes, the patentee says, "as these tubes open below into the lower part of the boiler, and at their upper ends into the upper part of it, below the water-line, the water, which will become highly heated in the lower parts of the tubes, will naturally ascend, and that with considerable rapidity, towards the upper part, where they will give out their steam, and, by the action of the water circulating through them, they will necessarily draw the water in the lower part of the boiler towards them, and effect the required circulation."

IMPROVED POWER LOOM; *Erastus B. Bigelow.** The patentee describes his improvement as follows:—

"My improvements consist principally in the manner in which the shuttles are thrown; the manner of raising and depressing the shuttle boxes, and the manner in which the picker is relieved from the shuttle.

"In throwing the shuttles I cause the two picker staves to operate simultaneously, so that the shuttle may be thrown from whichever of the boxes is presented to their action. This is effected by the use of one picker treadle only, which is acted upon by a cam ball, in the usual way of working such treadles. From this treadle two bands are extended, and pass around the two picker pulleys, in such a manner that when the treadle is depressed, both the picker staves will be set in action at the same moment. By this arrangement two or more shuttles may be successively thrown from the same end of the loom by the action of one treddle.

"The shuttle boxes are raised and lowered in the following manner. A shaft extends along under the race beam, from one shuttle box to the other, and carries pinions which take into racks attached to the shuttle boxes; it will be manifest, therefore, that by causing this shaft to revolve, the shuttle boxes may be raised. The revolving of this shaft is effected by the action of a spiral or other spring, one end of which is attached to the frame of the loom at its back, and said spring extends forwards towards the lathe; from this forward end a band, attached to it, passes around guide pulleys, and also around a pulley upon the above named shaft, to which latter the said band is attached. The action of the spring, by its drawing upon the band, will cause the pinion shaft to revolve, and will consequently raise the shuttle boxes. Should this spring be thrown out of action, and the band by which the shuttle boxes are raised be relaxed, they will then descend by their own gravity. To take off the tension of the spring there is a cam upon the main shaft of the loom, which cam, as the shaft revolves, depresses a treadle, to the end of which a band is attached which operates in such a way as to relieve the shuttle boxes from the action of the spring, and they then descend.

* Abstract of English Patent, given at page 29 of our 35th volume.

"In relieving the picker from the point of the shuttle, I make use of the protection rod constituting a part of the apparatus employed in the ordinary power loom for stopping the loom when the shuttle does not arrive home in the shuttle box. From the protection rod, which extends along below the shuttle boxes, I allow a small arm, or finger, to descend, which finger, as the lathe comes up towards the breast beam, strikes against a stop, or pin, attached for that purpose to the frame of the loom, causing the protection rod to rock or revolve to a short distance. This gives motion to two arms, which extend out from the extreme ends of the protection rod, opposite to the outer ends of each of the shuttle boxes; from these arms motion is communicated to a lever, which works on a fulcrum over the outer ends of each of the shuttle-boxes, said arms being connected to the levers by rods, or wires. By depressing the outer ends of these levers, their inner ends are raised, and to these ends are appended rods which carry pieces of wood or metal, which when down rest on and embrace the picker rod, and in that position they serve to hold the picker at a short distance from the end of the shuttle-box, and to stop the shuttle; the picker is then removed from the point of the shuttle by the raising of the lever, the picker being made to pass home to the end of the box, thus leaving the shuttle and shuttle-box free to be raised or lowered without obstruction, the picker being also ready again to act on a shuttle. The picker is removed from the point of the shuttle, after the block has been raised by a rod, actuated by a spring, which rod is connected with the picker stave by a cord, in order that the stave may, by its motion, move the rod, also that it may not impede the motion of the picker.

Stop-cock for Water and Gas Pipes; *James Robertson*. This stop-cock has a sliding valve, resembling others which have been used, and it is so constructed as to admit of the easy sliding of the valve, and, at the same time, of its being pressed against its seat after it is in its place; and also to admit of the cleansing of the chamber from any dirt that may accumulate within it.

The box is constructed as usual, with two side pieces, which fit into the pipe, and a top piece in which works the screw, which moves the valve up and down. The valve has three projections, one at top, with a vertical slot, in which plays a projection from the nut that fits on the screw, and one ear at each side. The valve is pressed to its seat by what the patentee calls a "wedge," which is attached at top to the nut, and works up and down with it—it branches off, and each branch acts upon two projections on the back of the valve, one towards each edge. Each branch, at the edge, is provided with a projection, which slides against the side of the box opposite to the valve seat. When the screw is turned with the view of shutting the valve, the two branches of the wedge are resting on the top of the projections on the back of the valve plate, and thus as the wedge descends it carries the valve with it, without pressing it against its seat; but when the valve has reached the bottom, the two projections on the back of the branches of the wedge have reached two notches in the side plate of the box, which permit the branches of the wedge to slide over the projections on the back of the valve, and thus wedge it to its seat—the slot in the piece which projects from the upper part of the valve allowing the wedge to descend after the valve has reached the bottom. The bottom of the chamber is provided with a seat for a conical valve, which works up and down by means of a lever passing through the casing for that purpose—when the valve is lifted up, the dirt passes out.

NOTES AND NOTICES.

Ornamental Engraving.—The new Austrian bank notes, which made their appearance with the new year, are exceedingly beautiful, indeed far too beautiful for bills of credit. They resemble the steel-plate engravings in the English Annuals. They increase in beauty and elegance in proportion to the magnitude of the sums they represent. These new notes have created quite a sensation in our capital; and for several days after they were issued, the national bank was besieged by persons anxious to obtain them. They are for 5 florins, 10 florins, 20 florins, 50 florins, 100 florins, and 1,000 florins. The principal artists in Vienna have been employed in preparing the designs and executing the engravings. The paper employed for these bank notes is of a most superior kind, and manufactured for the purpose. Of its strength an idea may be formed from the fact that a strip of it half a yard long will bear the suspension at its extremity of 35 pounds weight—*Vienna Paper.*

Effects of Frost on Railways.—Such was the slippery state of the rails upon the Eastern Counties line on Thursday last, that the evening train was with difficulty conveyed from Romford to the Brentwood terminus at a very reduced rate of travelling, with the aid of three engines. The same difficulty has presented itself, more or less, upon all the lines, the engines being at times only made to progress at starting by the application of manual labour.

Government Fire Engines.—The defective state of the fire-extinguishing *materiel* in the Tower, at the late conflagration, has at last attracted the notice of the government authorities. The Lords Commissioners of the Admiralty have issued instructions that all the fire-engines in the Woolwich Dockyard should be worked with water by the police force every ten days, to ascertain that all the apparatus continues in proper order, and to ensure their efficiency in case of their services being required. One of the inspectors of police is to be present at such trial, and to be responsible for the engines being in good working order. An examination of the fire-engines, &c., in all the dockyards is being made, with a view to their being put into an efficient state.

Clay Buttons.—At the Annual Meeting of the Liverpool Polytechnic Society, held last week, it was stated that 5,000 gross of buttons are now made weekly at Messrs. Minston and Boyle's, Stoke-upon-Trent, according to Mr. Prossen's dry powder process, described in our 23rd Vol. p. 592. The demand for them becomes greater than can be supplied by the present number of presses.

Supposed Spontaneous Combustion on board Her Majesty's Steamer Avon.—The Avon had been to Cork and Liverpool to embark volunteers for the navy, and had left the latter port for Plymouth. While in the St. George's Channel, about 20 miles off the Bishop's Light, and 30 from land, about half-past 4 in the morning, the stokers at the furnaces complained of an unusual quantity of smoke, when it was observed that it came from the door of the larboard coal-bunker. The scuttle over this bunker was opened, and some water poured down on the coals, but the water not reaching the flames, it aided rather than retarded their progress. The scuttle over the after coal-box, five feet from the end of the boiler, was then opened, and the flames bursting forth, displayed the head quarters of the enemy. The scuttle was immediately replaced to prevent a current of air from assisting the flames, and the deck opened further forward, where the coals were moved and lifted, that the water might penetrate to the centre. This had the desired effect, for after throwing down a large quantity of water, the fire was got under. By the most arduous and incessant exertions for six hours and a half, the ship was saved, and got into Milford, where she had pieces of elm plank fastened to her outside, and a portion of her deck renewed, before she ventured again to sea. On an official investigation of the Avon, it is found that on her larboard side the ends of four beams are so burnt as to require new; the shelve-piece and water-way are partly destroyed; the internal plank is entirely consumed, and the outer burnt nearly through. Nothing could have saved the vessel had she burnt through at this place, it being 18 inches below the water line. The deck is burnt fore and aft, from 12 to 14 feet, and in a transverse direction from the side nearly 6 feet. It is supposed the fire commenced about 6 or 7 feet below the deck, on the upper part of the coal boxes, and must have done serious damage before it was discovered, exposing the persons on board to the most imminent danger.—*Newspaper.* [We see no evidence in all this of the alleged spontaneous combustion. Ed. M. M.]

Coal in Borneo.—A recent expedition to Borneo has ascertained that this island is likely to prove of vast importance to the commerce of the Indian seas, large beds of coal having been discovered in it. Many of the specimens prove to be of superior quality. The coal mines of Borneo are stated to be easy of access, and they extend along the coast of Pulo Cheremin, an island at the mouth of the Borneo river running out towards the sea, and also extending inland, but how far, or to what depth, has not yet been discovered, though both are evidently considerable. In Pulo Kain Arrang, another island about half a mile distant, coal had been found on the surface, the quality of which, however, was not equal to that of the former, although there was every reason to believe that veins of a superior description existed there. The main land of Borneo itself afforded excellent samples, which the natives described as existing in large quantities; and some of them, whose intelligence and veracity could be relied on, stated that there were "mountains of coal, and that hundreds of ships might be laden with it."

Proposed Junction of the Pacific and Atlantic Oceans.—In Mr. Stephens's "Travels in Central America," he advocates the bold design of joining the Atlantic with the Pacific Ocean by means of a canal between the Gulf Nicoya and the harbour of San Juan, a distance of only about sixteen miles. From the lake of Nicaragua to the harbour of San Juan on the Pacific, the distance is less than sixteen miles; and this slender line of earth is the only important obstacle which impedes what would, undoubtedly, be the greatest, the most important alteration, ever effected by man in the physical arrangement of the globe. The proud mountains of Central America here bend themselves down—as if to permit and sanction the enterprise—to the trivial elevation of 600 feet; and through this hill it is contemplated to cut a tunnel of one mile in length, at the height of almost 72 feet above the water of the lake, and 200 feet above the low-water level of the Pacific; the distance from the lake to the tunnel being about 10 miles, and from the tunnel to the Pacific about 4 miles; whilst the difference of level could easily be overcome by lockage. The only engineering difficulty in the execution of the work would be the tunnel; and we must confess that the idea of an excavation, lofty enough to permit ships of 600 tons to pass through, with their lower masts standing, is, to us, even in these days, when engineers take all manner of liberties with mountains and valleys, somewhat startling; but Mr. Stephens speaks of it with perfect coolness.—*Quarterly Review.*

Rules for Walking in Frosty Weather.—1. Take short, quick steps at all times, and in all situations. 2. If descending any inclined road, take care to put down the toe first. 3. If ascending, plant the heel firmly. 4. In all cases, keep the body in rather a stooping position, with the knee joints playing loosely. If you attempt the *stately*, ten to one but you measure your length upon the ground. Better to toddle awkwardly home, than be carried on a shutter, with a leg or arm broken.—R. A. B.

New Locomotive.—A mechanician named Macdinger, residing at Newbourg, on the Danube, has constructed a carriage on three wheels, which, by the effect of some internal mechanism, was impelled at the rate of four leagues an hour. A child may set the machine in motion, and the inventor is at present constructing a machine on a larger scale, which he expects will render the construction of railroads no longer necessary.—*Augsburgh Gazette.*

Postage Envelopes.—A correspondent requests us to call the attention of persons who, in writing letters of business, use envelopes, to the importance of their writing the address upon the sheet enclosed. The address being written upon the envelope only, the document cannot be made available in matters of legal proof, which is frequently the object of both the sender and the receiver.—*Times.*

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No. 964.] SATURDAY, JANUARY 29, 1842. [Price 3d.

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EMSLIE'S CHIMNEY SWEEPING APPARATUS.

Fig. 1.

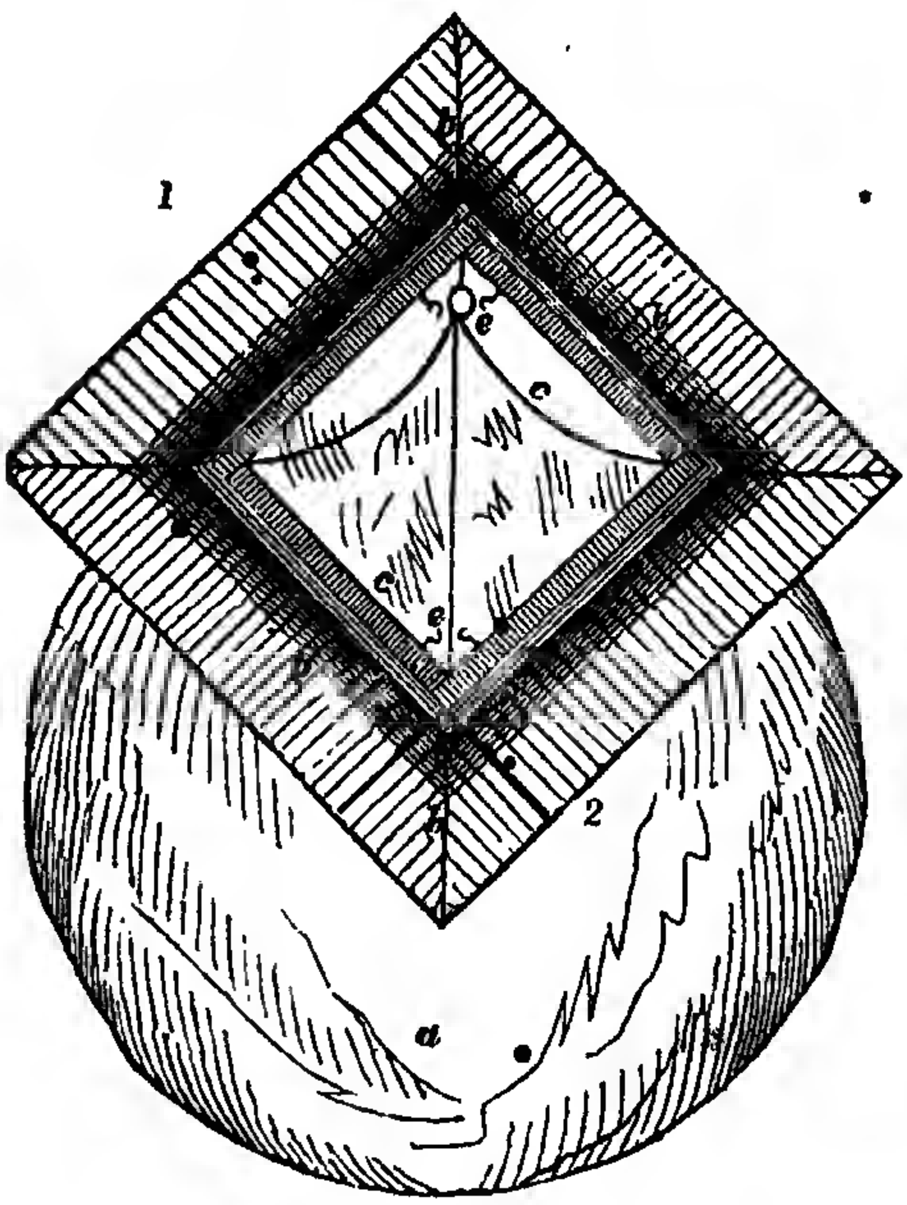


Fig. 2.

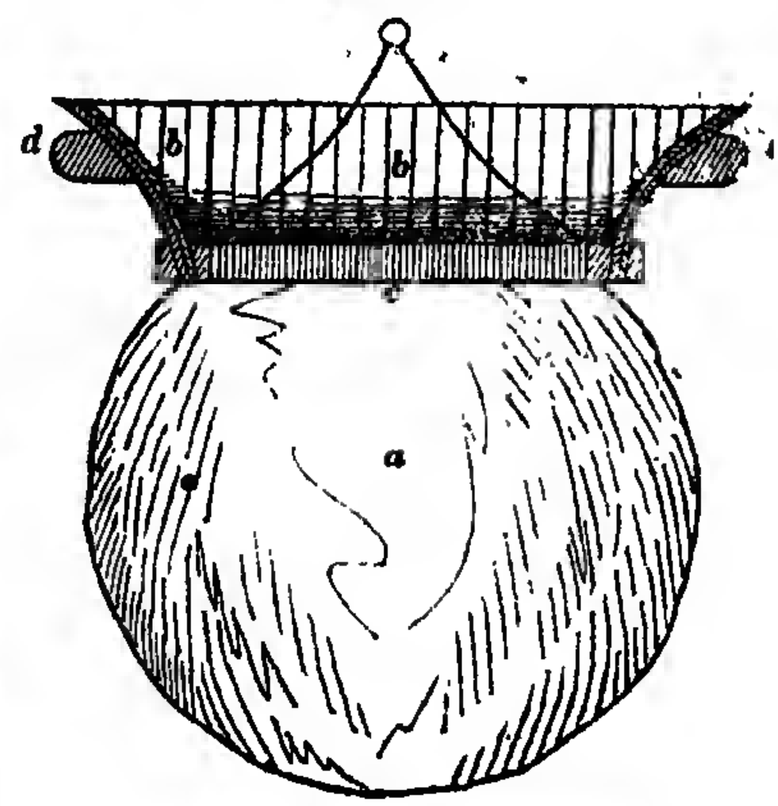


Fig. 3.

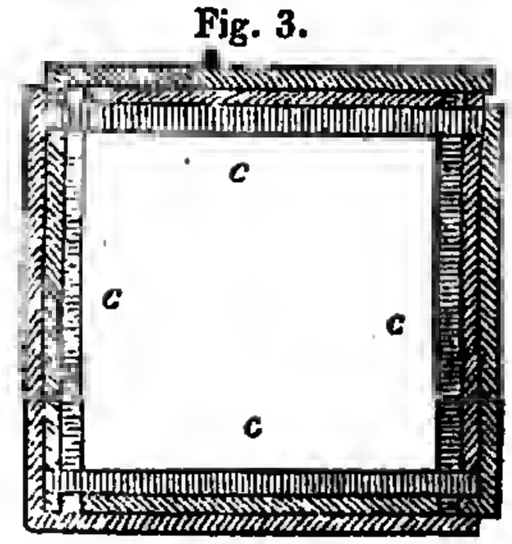


Fig. 4.

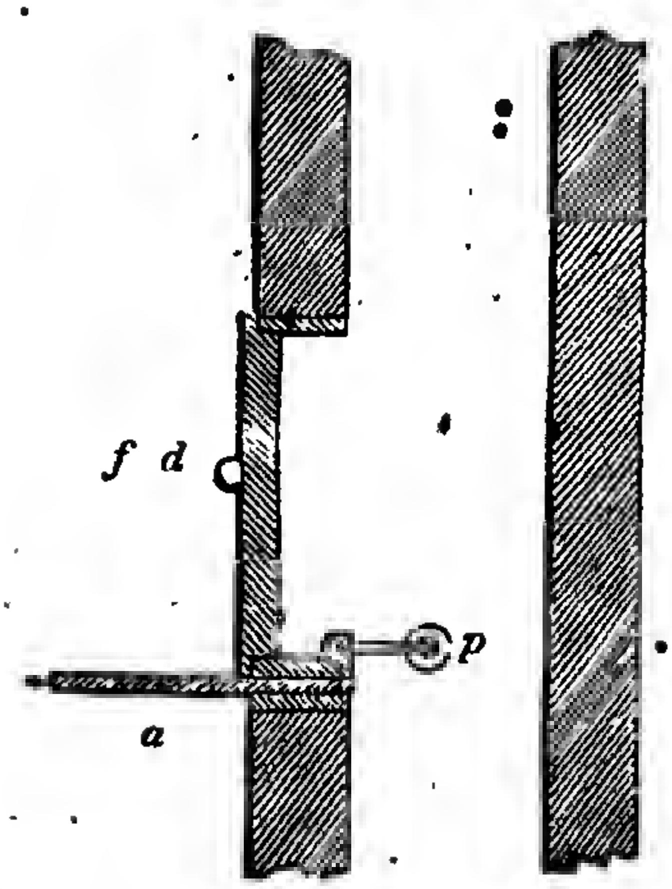
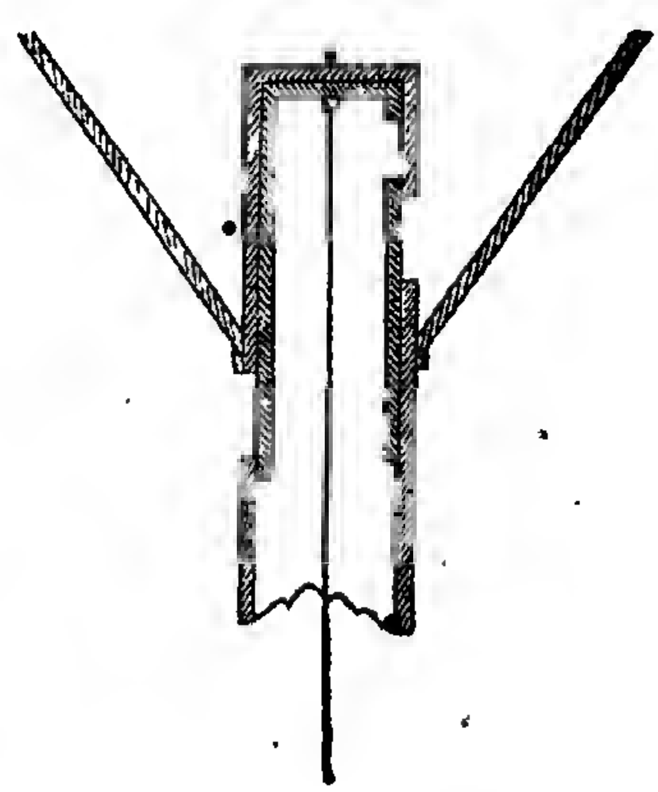


Fig. 7.



MECHANICAL CHIMNEY-SWEEPING.

Newcastle-on-Tyne, January 12, 1842.

Sir,—Parliament having enacted that the use of children in the cleansing of chimneys shall terminate in June next, I beg therefore to submit you, for the perusal and consideration of your numerous readers, some plans and suggestions which have occurred to me recently, for effecting by machinery that necessary object—a clean chimney.

In many places in Scotland, and probably in England likewise, it has been usual to cleanse chimneys from the summits of the flues, by working up and down therein, by means of a rope, a whalebone or cane brush, weighted sufficiently to carry it over any impediments it may meet with in its descent. That this mode is effectual is well known; but as it is attended with very great danger to the persons employed, and as considerable damage to the roofs, chimney-pots, &c., frequently results therefrom, it has not been of such general adoption as I feel assured it would have been, had these objections to its use been removed. It has been said, that the insides of the flues receive considerable damage from the action of the weights attached to the brush; I allow this—but at the same time think that the difference between this mode and others in use for the same purpose is but trifling. Glass's machine, and that most inhuman of appliances, a human being, are continually bringing down with them pieces of the pargetting, in too great quantities, often, to escape our most casual observation. As the rope and weight-brush mode is capable of cleansing any flue, however intricate may be its construction, if it has descent sufficient in its angles, (that is, if the angles of the flues be any thing more than right angles,) and if the first-named difficulties to its use can be overcome, I think it will be judged one of the most useful of means—embracing efficacy, simplicity, and economy, in a very great degree. The impediments to its use I hope to set aside in the following manner:—

At the highest accessible part of the chimney breasts, (which, in most cases, will be just under the roof of the building, or outside the roof, if it be flat and easily got at,) let tin frames with doors, one door for each flue, be constructed, so as to shut perfectly tight, and to open outwards, to be fixed solidly into the brick or stone work of the chimney, as the case may be; and on the bottom part of the frames, inside of the doors, have pulleys, sufficiently long to project over into the centre of the flue, and to shut up, when not in use, in a line with the doors when they are closed. After having swept that part of the flue between the iron doors and the top of the chimney with a long flexible handled brush made on purpose, place the weight and brush through the door-way down into the flue, and the rope over the pulley, and work it up and down in short lengths, till the flue is judged to be sufficiently cleansed. All the soot will, of course, fall down into the fire-place, as usual, from whence it can be removed. In the accompanying sectional view of a flue, fig. 4, *f d* represents the flue-door; *a* the damper, and *p* the pulley. A more simple, safe, and efficacious plan for effecting the object in view, I think, it will be difficult to find.

As in all the plans for sweeping I shall here lay before you, I purpose using the same kind of doors and pulleys, the previous description of my plans in respect thereto will suffice. I beg to add here, however, that in connection with the iron door-frames I propose placing dampers, so that on any flue taking fire, it may be extinguished by the mere closing of the same, and before any danger to the building, or to the surrounding buildings, could accrue.

If the small emission of smoke which would generally take place from the edges of the dampers were obnoxious—as it would be if placed in a sleeping apartment, such as the garret frequently is—this might be avoided by making the damper to work in close cases, with air-tight glands.

The offensive smell of soot, and other discomforting circumstances peculiar to "chimney-sweeping days," induce, no doubt, frequent delays in cleansing, which are the cause of many destructive conflagrations. I therefore suggest the following remedy.

As before stated, let the flue-sweeping doors and pulleys be fixed; then have a machine constructed on the plans re-

presented in figs. 1 and 2, the former of which shows the machine in a closed state, and the latter a section of it through the line 1 2 of fig. 1. *a* is a leathern bag for catching the soot scraped off the sides of the flues by the scrapers *b b*. These scrapers are to be formed of thin steel spring hoop, of, say, 1 inch width, turned over slightly at the top, and fitted at the bottom on to four iron plates, each turned in the centre to a right angle, and made to closely run over each other, as depicted in fig. 3. The steel scrapers, which will join at the edges, are to be fixed on the outside of the inmost plate and on the inside of the outmost, so that

Fig. 5.

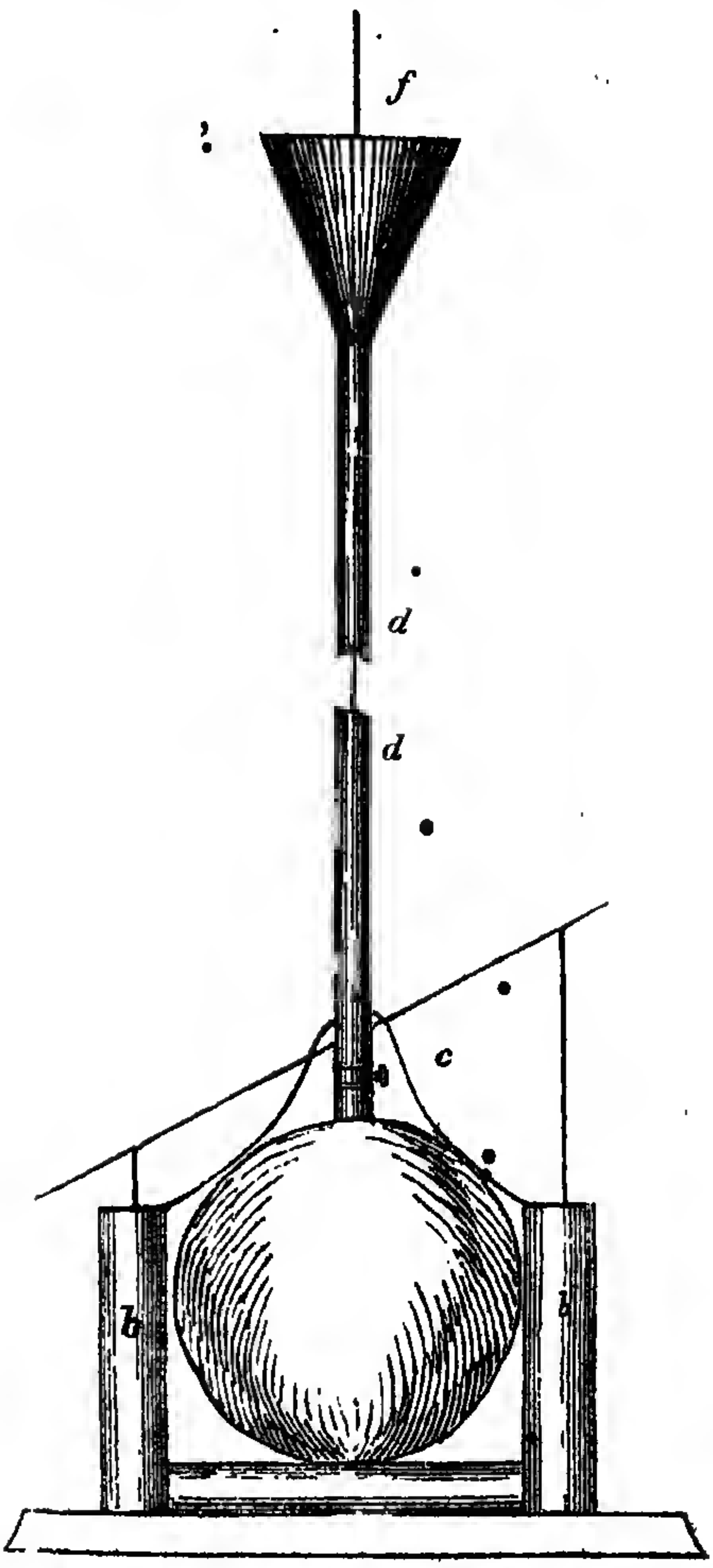
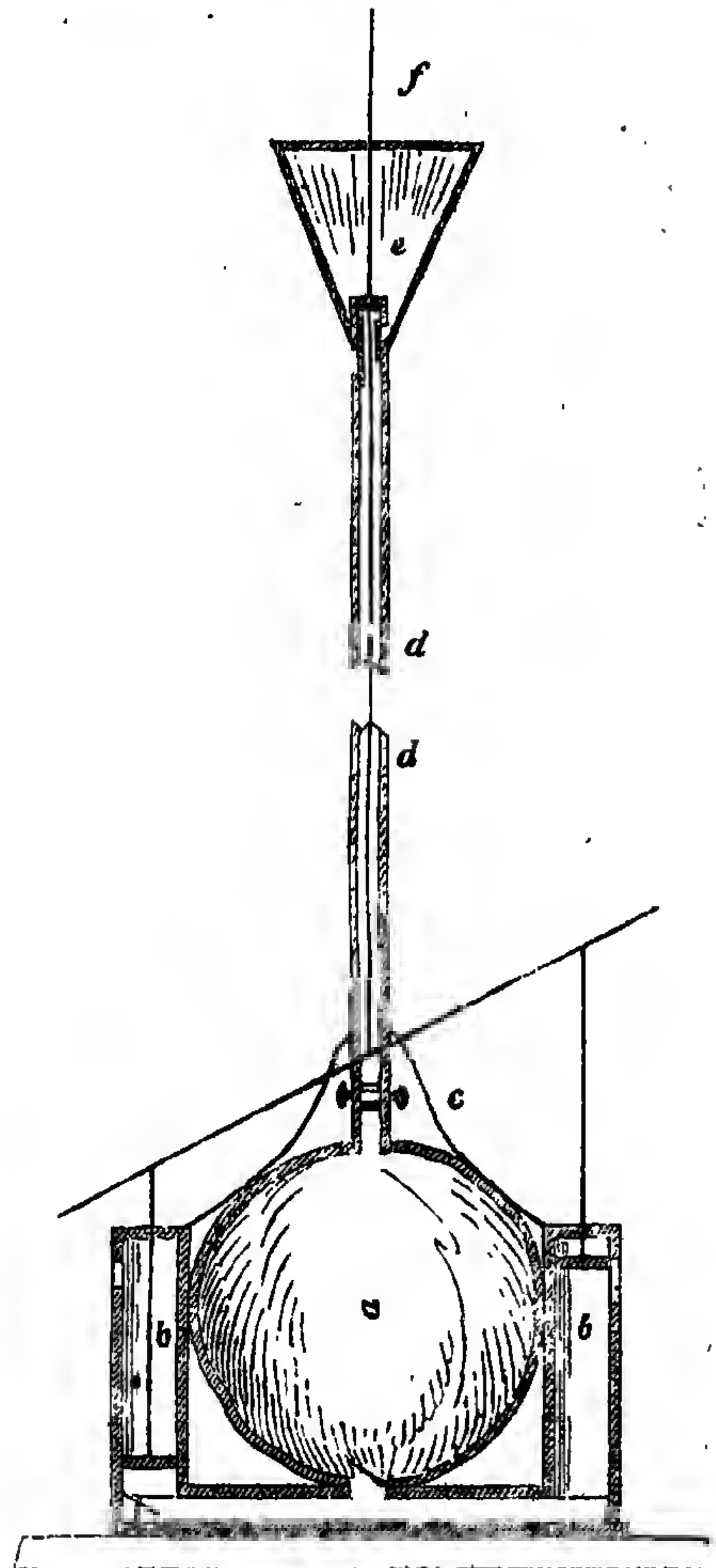


Fig. 6.



they may run closely over each other. Within the scraper plates sufficiently strong springs, *c c c c*, are to be fixed, so that the scrapers may be forced and kept out to every side of the flue. Under the turn-down edges of the scrapers I propose fitting leather cushions, *d d*, to prevent any soot getting down into the chimney, when the scrapers may be pressed down on coming into contact with any rough surface in the flue. The edges of the scrapers are turned down, in order to facilitate their getting over any projection that may occur in the passage up the flue of the machine. To have particular cleanliness, there should be a chain down each flue, to be hooked up out of sight of the fire-place when not

in use, so that the before described machine might be at once attached and drawn up, instead of letting a chain down the chimney each time, which would of course carry with it some portions of soot. A small windlass, capable of being moved to each of the flue-doors, would be requisite, in order to get the machine up the chimney, with the soot it might collect. The way to sweep a flue with this machine should be this:—Attach the machine at the bottom of the flue to the hook on the chain, then wind it up the chimney till it arrive at the door, then sweep the upper part of the flue as before described; the machine being allowed to remain at the place to which it was drawn till this be accomplished, and which would, of course, catch the soot falling from the action of the broom. Any soot which may hang around the scrapers should be swept into the leather bag; and then, having stopped the action of the springs in the inside of the machine by means of the screws *e e e e*, (fig. 3,) withdraw it out of the door-way, remove the soot, take it down to the next fire-place, the flue of which is to be swept, and proceed as before. At the enlarged part of the flue, round the fire-place, a small hand-brush should be used to remove the soot. A machine of the nature here described might be kept in every house of good size, and worked by the servants, who, for their own sakes, would be as cleanly as possible in its use.

The next and last method I have to propose, is perhaps more for the sake of exhibiting a very novel mode which has occurred to me of effecting the object in question, than as a means likely to be of good use or general adoption; but if not of use itself, it may in the minds of others suggest some plan of greater utility than any yet described. *a a*, Figs. 5 and 6, is a metal vessel capable of sustaining a considerable pressure of air, forced into it by the pumps *b b b b*; *c c*, is a stop cock or valve for shutting off from, or regulating the pressure of air in the leathern hose *d d*. This hose must be made perfectly air tight, and sufficiently strong to resist a considerable pressure from within; *e e* is a leathern bag, at the throat of which a valve is placed, as shown enlarged in fig. 7, and from which to the air-vessel *a*, is a strong string of any tough material for regulating its action. Round the leathern bag are placed steel springs to cause it to collapse when the air is emitted therefrom; at the top of the bag is placed a flexible feeler *f*, made of whalebone, or any such material, with a round knob of any hard substance at top. To use this machine, first condense air into the vessel *a*; when deemed sufficiently powerful, having the hose ready to project up the chimney, turn the tap *c*, which will allow the compressed air to flow up the hose and give it considerable stiffness, yet retaining great flexibility; on the air passing up the hose it will (the string being slack) force the valve to the top of its seat, where it will remain so long as the pressure in the hose shall last, and the string be untouched; thereby preventing any air getting into the bag *b*, which, therefore, in consequence of the outside springs, will be in a closely collapsed state, and offer no impediment to the free passage of the hose up the chimney. When the hose has been forced sufficiently high up the chimney, the string communicating with the valve is to be drawn till the side aperture of the valve, and the one leading into the bag correspond, where it is to be kept by means of any small apparatus fixed in the air vessel. On the condensed air being admitted to the bag, it (the bag) will of course distend, and fill the aperture of the flue. When it is to be drawn down, the soot, (if the edges of the bag, which are to be made of tough flexible leather, have sufficient hold of the sides of the flue,) of course coming before it, should the bag stick in the flue at any part, or should it be necessary to go over any place a second time, or more, the valve string is to be further pulled down and there retained, till the whole of the air in the bag becomes excluded; the bag, from the pressure of the springs, will then again collapse, and permit the upward motion of the hose to any height in the flue required; by then letting the valve go, it will, by pressure of the compressed air, resume its position opposite the aperture into the bag, if the string communicating with it, be set, for its assuming that station; otherwise, it will go to the top of the valve seat, and preclude the emission of air in any direction, when the bag will again become filled with air, and the process for bringing the soot down the chimney may be continued.

Here I beg, for the present, to con-

clude my suggestions under this head, and to hope, that the plans I have submitted to you may meet with immediate consideration from your numerous readers, and if approved of, speedy adoption. Let the barbarous plan of employing little children in the most humble of occupations (viz. chimney sweeping) stop. Let us not even wait for the arrival of that time, however short it may be, which our legislators have fixed on for doing this justice to humanity; but let us put it down with one accord immediately. Why, for a single moment beyond what is absolutely necessary should we protract the sufferings of these poor infants? Even should my plans not succeed, where can be our boasted acquirements in mechanics, if there is not another, ay, twenty other plans forthcoming for effecting this object? And surely from some of these, something like an efficient process could be obtained—some cheap and simple process—some such process as the occupants of houses, or their servants, could use with facility—some process which, from its cheapness, would cause its adoption—if nothing else could work on the feelings—and this attained, Necessity, a law stronger than the wisest of us could frame—would cause master sweeps to desist from their wanderings, and to withdraw from suffering, and from the pitying eyes of every walker of the public streets, the wretched objects of our commiseration, the "poor little chimney sweeps."

Should this be accomplished from my suggestions, my gratified feelings will indeed amply reward me.

I am, Sir,

Your most obedient servant,

JAMES A. EMSLIE.

P. S.—Sir,—Allow me to add, with respect to the rope and weight-brush mode of sweeping chimneys, that the weight may be inserted in the heart of the brush, which it can readily be, by having the whalebone or cane fixed on to strong leather, and this sown round the weight. The injury the pargetting of the flue is said to derive from the action of the weight in the method at present in use, will, I think, by these means be entirely obviated.

HARTLEY'S FIRE-PROOF BUILDING—FIRE PREVENTIVE COMPANY'S CEMENT.

Sir,—I am sorry that the shortness of Col. Maceroni's memory should have betrayed him so much into error on the subject of *fire-prevention*, as at this time to recommend it to my attention. I really imagined that, so far as I was concerned, that topic, if not altogether exhausted, was certainly threadbare.

I have already repeatedly denounced our present highly inflammable mode of house-building—have constantly advocated the general employment of fire-guards, incombustible draperies, and other preventives—and have more than once suggested the "sure preventive," (alum solution,) for rendering cotton and similar fabrics partially incombustible. Mr. Hartley's method of protecting buildings, with all the other intermediate projects for preventing the occurrence or extension of fires, down to the introduction of the "Patent Fire-preventive Cement," have each, at different times, been advocated by me in your by-gone volumes.

The old motto, of "Prevention better than cure," has been conspicuously set forth and illustrated upon many occasions.

I am truly sorry to find that the gallant Colonel entertains such incorrect notions with regard to the fire-preventive cement, which he deridingly describes as "plaster made of Roman cement and size." Had he witnessed any of the highly satisfactory trials and experiments which have been made with this cement, in London and in some of the provincial towns, most of which stand recorded in your journal, he would have been convinced of the antiphlogistic powers of this preparation, and of the vast benefits which must attend its extensive employment. Col. Maccrone states that "beams of wood may be charred by fire through iron plates, but will not break into flames without a current of air is admitted." The cement in question is still more efficacious in this respect; the iron being a good conductor of heat, the charring process goes on very rapidly beneath it; the cement, on the other hand, being an excellent non-conductor, the charring goes on much more slowly. In fact, under circumstances where charring would inevitably take place beneath iron plates, it would be completely prevented by the cement.

Colonel Macerone confounds this "cement" with "common plaster;" he might almost as well compare iron to wood.

I beg it to be distinctly understood, that I am not at all disposed to cavil about which is really the best fire-preventive process; right glad should I be to see any protective plan, (even though it were the least efficient,) generally adopted. I am only vexed to see so much apathy prevailing with regard to this subject, that *no preventive measures whatever* are adopted; and even the *cure* is left entirely to those whose sole business it is supposed to be.

So thoroughly incorrigible have we now become, that all the legislative enactments—which, if carried out, would do much to prevent the spread of fire—are become dead letters on the statute-book. Any such preventive law as that suggested by Col. Macerone, at page 60, would be denounced as an outrageous infraction of the "liberty of the subject."

The general employment of incombustible stairs, whether of stone, iron, slate, or even wood effectually protected by cement, would, I have often asserted, and again repeat, completely change the character of London fires. Beyond this, any protection afforded to the partitions, ceilings, &c., either by Mr. Hartley's, or any other effectual process, could not fail to be highly advantageous.

In several recent instances, *public buildings* have been constructed in a fire-proof, or partially fire-proof manner, and it is devoutly to be wished that the same principle may be adopted in *domestic dwellings*, where, although property to an equal amount is not at stake, there are lives to be preserved, which are of far greater consequence.

I remain, Sir,

Yours respectfully,

W. BADDELEY.

London, January 24, 1842.

ON MR. R. ARMSTRONG'S NEW THEORY OF DIFFUSION. BY C. W. WILLIAMS, ESQ.

(Continued from page 63.)

But this Daltonian system of separation-diffusion, (meaning Mr. R. Armstrong's new version of it,) appears to be miraculously endowed with the still more extraordinary, and even discriminating faculty, not only of separating the gases, but of distinguishing those which are useful and combustible from the useless and incombustible! This, indeed, would be "extraordinary—if true." Thus we find that, according to the new version, "the lighter gases, which constitute the most valuable part of the smoke, have, according to Dr. Dalton's law of the 'diffusion of gases,' before referred to, a natural tendency" (not to mingle and become diffused, as Dr. Dalton thought and wrote, but, hear reader,) "to *leave* the carbonic acid gas," (itself the heaviest of them all,) and rush into the ash-pit, as into a vacuum; at the same time carrying the light carbonaceous matter with them." Mr. Armstrong may well say of Mr. Cheetham's plan, which brings such impossibility-working into action, "I believe it to be one of the greatest discoveries of modern times." He might with the greatest safety have said, the *very greatest.*

But he describes another peculiarity, with respect to the diffusive faculty of atmospheric air, which the great Dalton himself never even dreamed of, and which is thus referred to. "The atmospheric air, which is essential to support the combustion of those gases, not having this diffusive tendency to so great an extent, (how this curious fact has been ascertained does not appear,) requires to be supplied by artificial means, and for that purpose a *very small* fan is necessary." Hear that, Dalton and Graham, whose names are pressed into the service of this new theory of diffusion. Mr. A., with great sagacity and penetration, (that is, the penetration which enables him to see farther into the mill-stone than the man who picks it,) observes, "Here the question will no doubt occur to many, as to what is the probable effect of this necessary strong draught, or blast, against the boiler bottom," (from the 'very small fan!') This, we are told, is an important question; but he adds that, "fortunately, it admits of being easily answered by any *chemist* who duly considers, (and understands,) the *rationale* of the process as above given." Undoubtedly—for any chemist who can understand, not the *rationale*, but, in plain English, the absurd nonsense of "the process as above given," can have no difficulty in answering any question.

But we have a still more curious development of the new theory, by which we find, that the hitherto supposed *injurious* consequence of a mixture of incombustible with combustible gases, (as Davy had accurately shown,) is actually converted into a most salutary and useful one, and by virtue of a "*diluting*" process. Let the theory, however, speak for itself. "Moreover, as these changes and combinations are being continually and rapidly effected, and are, in this case, carried on in an atmosphere, (so to speak,) surcharged with a certain portion of nitrogen and steam, which, being neither supporters nor combustibles, but being propelled by the fan," (oh, this magic "little fan!") "in uniform mixture with other elastic fluids that possess these properties in an eminent degree, there can be no doubt," (I ask, will any one take the trouble "to doubt" on the subject?) But in this process of *double combustion* (!) these two incombustible substances, (nitrogen and steam) effect the very important purposes of *diluting* and *modifying* the oxydating property of the blast." Modifying the oxydating property of the blast!!! This certainly is enough to take away a man's breath. Nitrogen performing the very important purpose of diluting the oxydating property of atmospheric oxygen!

But let us hear the expounder of this rare theory out. "In fact, the peculiar mixture of elastic fluids thus effected," (by the diluting process,) "produces what is, I believe, called by some mineralogists, and others, conversant with the blow-pipe, the "*deoxydizing flame.*" This identity between the "deoxydizing flame" of the blow-pipe, and the useful "diluting process," of mixing atmospheric air with nitrogen and steam to effect a double combustion, and modify the wicked strength of "crude air," is truly ingenious.

Be this, however, high Dutch, or low Dutch, we are told that, "At any rate, a similar result is characteristic of Mr. Cheetham's process, in contradistinction to the ordinary process of blowing the fire with *crude air*," (crude air! too strong by half for either mortals or combustibles, until diluted with nitrogen and steam,) "which latter method, whenever resorted to, has always effected the rapid oxydation of the grate bars, and the destruction of the furnace." Attend to this, ye advocates for hot air and cold air, and the introduction of "*crude air*," hitherto erroneously, no doubt, called "*pure air.*" Behold this new recipe to make your furnace burn well,—dilute your "crude air" with nitrogen and steam, and thus you will obtain that valuable result, viz. the deoxydizing effect of the mineralogist's blow-pipe. This is true by the mass! For we are now told that, "according to Mr. Cheetham's plan, when the *smoke itself* is actually made, in part, the medium for blowing the fire, the draught produces a totally different result," (not a doubt of it,) "while the manner of effecting it is as complete and simple as it is *unique*, in its application to steam-engine furnaces." *Unique*, in truth, it is. Unquestionably this process may well be described as one by which the smoke itself shall be made the medium of blowing the fire so as to produce that great desideratum, the unique, diluting, and deoxydizing effect, of modifying the injurious action of "crude air."

In sober earnest, Mr. Editor, I ask, is it not lamentable to think how real improvements in the arts may be retarded—how business men may be led astray, and many gulled by such seeming-wise, but utterly nonsensical, theories as this?

The paper, too, which I have just reviewed comes from that very individual who, in a letter in the *Mechanics' Magazine*, last year, elaborately condemned the principle recommended in my Treatise on Combustion, as being chemically and practically wrong. That he should have come to that conclusion appears natural, seeing that the principle I advocated was in accordance with the hitherto received notion, that Dr. Dalton's diffusion meant the intimate intermingling of gases—whereas, Mr. Armstrong's condemnation of the principle was on the idea, that the Daltonean diffusion meant "separation," and the one class of gases "leaving" the other.

I may also state another fact, proving that Mr. Armstrong sees what no other man can see, and which is the only way I can account for his new theory of diffusion—namely, that before there was a single furnace erected by me or by my direction, for carrying out my principle, save my own and that at the Liverpool Water Works, (neither of which he had seen,) he sat down and deliberately penned the following passage, in a report by

him on the supposed principle of my furnace—"I have long paid great attention to the operation of smoke burning furnaces generally, and more particularly to those constructed on the principle so imperfectly attempted by Mr. Williams." (And again, still having never seen a single furnace of my construction.) "This *conviction* has been forced upon me by a careful and unprejudiced examination, (careful and unprejudiced!) of a great many steam engine furnaces, erected both by myself and others, including several constructed by Mr. Williams himself." What, Sir, will honest, well meaning men say of such "careful and unprejudiced examination," seeing that when called on he was unable to point to a single one which could justify the slightest ground for the word "examination," and for the plainest of all reasons, namely, that none such were in existence at the time this (wisely undated) report was written.

For the sake of truth, however, and to do justice to Mr. Armstrong, I must state that he subsequently consented to a letter of recantation, and wrote to my agent, stating, among other things, as follows: "I find that the opinions expressed in my report before named, were formed on erroneous data, and therefore calculated to mislead. I therefore consider it due to the public and the inventor, and not less to yourselves, to make this explanatory statement, as I find my report has been misconstrued and circulated to your injury, and as you have expressed your satisfaction with this explanation, and agreed, at my request, to waive any legal proceedings in respect to such injury."

This paper, my solicitor states, Mr. A. consented to sign, on three conditions, (dictated by himself,) one of which was, "that it is not to be published or circulated, but only referred to at the office of the solicitor." Having subsequently evaded the actual putting of his name to the paper, (as if that were of any importance, after having admitted its necessity and correctness,) I feel absolved from the restriction as to publication. The verbal admission of his error (and consent to sign,) was in fact as satisfactory as a written one.

I am, Sir, yours, &c.

C. W. Williams.

Liverpool, Jan. 17, 1842.

PLATING BY ELECTRIC PRECIPITATION.

Sir,—I see in No. 956 of your Magazine a letter from Mr. Walker, claiming certain improvements in the electrotype, for which patents have been taken out by others; but in my opinion, neither Mr. Walker, nor any other person has a right to take out a patent for either electro-plating or gilding, as the matter was made public by Mr. Sturgeon in his Annals of Electricity, very soon after the original discovery of the electrotype by Mr. Spencer, in a letter to that gentleman inserted in the work above mentioned. Mr. Sturgeon says in the letter referred to, "You will remember the idea occurred to me of giving medallions, coins, &c., taken by the process of voltaism, silver, or golden surfaces, by a similar voltaic process, employing a solution of either of those metals with the prepared matrix instead of a solution of copper.

From your obedient servant,

A Country Subscriber.

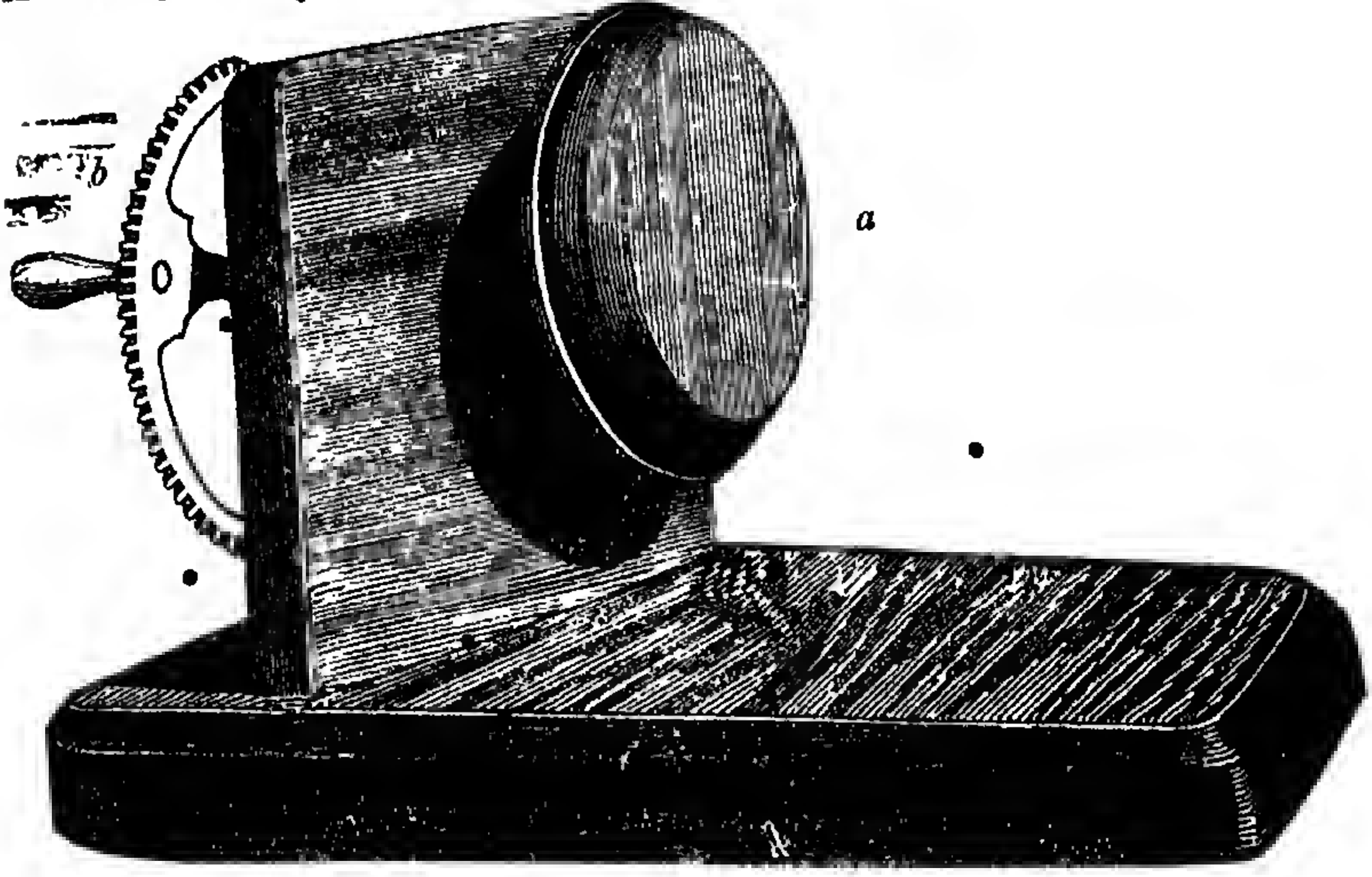
FENN'S REVOLVING OIL STONE.

[Registered pursuant to Act of Parliament.]

It frequently happens, that nearly as much skill is required in preparing and sharpening tools as in the subsequent use of them; and in the case of engravers in particular, success depends greatly upon the care bestowed upon the sharpening of their gravers. It is in many cases of the highest importance, that a *precise angle* should be maintained between the face and the belly of the tool, and the attainment of this desideratum by a backward and forward motion upon a stone lying in a horizontal plane, is a work requiring more than an ordinary degree of skill for its successful execution; a skill, in which those who possess it, justly pride themselves.

In order to obviate the greater portion of the difficulty which presents itself in the attainment of this object, Mr. Fenn, the well known tool-maker, of Newgate-street, has registered an ingenious little contrivance which is shown in the annexed engraving, by means of which any artist, or amateur, may readily ensure a fine edge of the required form for his gravers. It consists of a small disc of turkey stone *a*, mounted upon a suitable holder and axle, which has a small pinion

on its outer end on the opposite side of the supporting side frame or bracket; a multiplying wheel *b*, furnished with a handle, takes into and drives the pinion. A small quantity of oil being spread on the surface of the revolving hone with a piece of woollen cloth, the tool is held against it at the required angle, and the stone made to revolve by turning the wheel *b*.



The advantages of this contrivance, consist in producing with little care, and with great facility, any desired angle on the edge of every description of tools; the wood stand forming a rest for the right hand which holds the tool, while the left gives the necessary motion to the hone. The vertical position of the hone, also enables the operator to see from time to time, the angle which is being formed on the tool, while the smallness of the stone facilitates the employment of those of the very best quality only, and supersedes the use of any containing flaws or imperfections, which it is difficult to avoid when long slabs of stone are required as in the ordinary modes of sharpening edged tools. The continuity and rapidity of the motion thus produced, soon effect the desired sharpening. We have no doubt that the advantages of this contrivance will soon cause its very extensive, if not universal employment among artists.

THE SUPPOSED PERCUSSIVE ACTION OF STEAM.

Sir,—Mr. Parkes appears to me to have fallen into an error which many other philosophers have done before him, viz., that of inquiring more into *causes* than *effects*. He imagines that, according to the recognised laws of expansion, a greater portion of work is performed by the Cornish pumping engines than the steam used would warrant us to expect; and without taking into consideration the possibility that his calculation of the *effect* produced may be erroneous, he sets off into the regions of fancy in search of a *cause*: this cause he styles the "percussive action."

The first idea which the word "percussive" gives rise to is, that of the steam travelling through a partially vacuous space before it comes in contact with the piston, and acquiring through that motion a force similar to that acquired by any body in falling; or moving in any direction with a continuous propelling power applied to it. Such, however, cannot be the view taken of the subject by Mr. P., or he must obviously

be in error, as decidedly the reverse of percussive action is produced by so admitting the steam; for however rapidly a body of steam may flow into a partial vacuum, it must expand far more rapidly; and the outward portion, or that which falls on the piston first, will necessarily be attenuated in a great degree, and impart a force thereto little exceeding that of the partial vacuum which previously existed.

If, then, the travelling—if I may so speak—of the steam gives diametrically the reverse of "percussive action," we shall gain a maximum of this imagined force when the vacuous space through which the steam has to travel, between the induction valve and the piston, is the smallest that can be obtained. This is so palpably plain, as to admit of no dispute on the subject; and yet, if Mr. P. admits it to be the case, his theory at once falls to the ground. Let us imagine, for instance, a cylinder having a piston *fixed* in any part of it. Above this piston let us imagine a slide of inappreciable thickness, yet strong enough to bear the whole pressure of the steam, and placed so as not to touch the piston, yet at an inappreciable distance from it, and let the induction port be double or treble the usual size. Now, suppose the steam to be full on, and pressing on the slide with a force equal to 1,000 lbs., can we, without risking a charge of absurdity, imagine it possible that, by suddenly withdrawing the slide, the steam may be made to exert a force on the piston, exceeding that which it had previously exerted on the slide? If it would exert this extra force, whence comes it? The body of steam has not moved an appreciable distance, and consequently cannot have acquired an appreciable momentum; and I have just shown that, if it *had* moved, the reverse of percussive action must have resulted. This is so obvious, that I may be charged with prolixity in giving further illustration; nevertheless, I will say a word or two more.

If, by suddenly withdrawing the slide, the steam is made to exert a force of 1,500 lbs. on the piston, instead of 1,000 lbs., (the pressure it previously exerted on the slide,) the same, or nearly the same, effects must be produced on the parts of the cylinder submitted to the action of the steam; and, consequently, if a mercurial gauge were fixed a little above the slide, and marked a pressure of 40 lbs., the mere abstraction of the slide would cause the quiescent mercury to rise suddenly, and mark a pressure of 60 lbs.; and yet, all that we have done to the steam has been to substitute one base for another. If such an effect were possible, we may draw from it the most extravagant conclusions; for if a number of these cylinders, pistons, and slides were fixed directly to a boiler, the simple abstraction of one slide would suddenly raise the force in the boiler from 40 to 60; and if, at the precise moment when the steam was exerting this 60 lbs. force, another slide were suddenly withdrawn, the pressure would be raised to 90 lbs.; and if another were then withdrawn, it would be raised to 135 lbs.; and so on *ad infinitum*. Your readers will, I doubt not, smile at the absurdity of such a calculation, but those who are inclined to weigh the matter, will find that the idea is arrived at by strictly inductive reasoning; and, absurd as it is, it must hold good, as long as this "percussive theory" does.

Such, or nearly such, were the ideas which occurred to me when this theory first came under my notice; but as I imagined Mr. Parkes advanced it merely as an opinion, I took no further notice of the subject. I find, however, from a subsequent paper of Mr. P.'s, that he still upholds his theory, and brings forward what he seems to consider indisputable arguments in its support.

I have not the abstract of his last paper by me at present, but, if I recollect right, he states that if a mercurial gauge be attached to the cylinder, the sudden impact of the steam will cause the mercury to rise high enough to denote a pressure of 60 lbs. per inch, when the pressure of the boiler is only 40 lbs.; and that when the steam is admitted gradually, no such effect is produced. I believe 40 to 60 are the proportions; but at all events we will assume it to be so, for the sake of round numbers. Mr. P. also states, that in the larger engines the cylinder covers are deflected, or bulged outwards, when the steam is admitted suddenly; but when slowly, no such effect is produced.

Now, to a merely casual observer, these two arguments seem to tell strongly in favour of the "percussive theory;" but when examined into, we find them to result from causes entirely independent

of an additional, or "percussive force." With regard to the first argument, I would ask, how can Mr. P., or any one else, imagine it possible that a stream of mercury driven 100 inches, with the great velocity it must acquire from having so great an unbalanced pressure on one side, would suddenly stop and remain quiescent, when it had risen a sufficient height to balance the pressure of the steam? The momentum acquired by such a velocity would be sufficient to carry the column considerably higher, even though the whole pressure of the steam were instantaneously removed when the gauge marked its proper level. What, then, ought to be the effect when this momentum is aided by the continued pressure of the steam? *Theoretically*, a body of mercury under such circumstances should rise to double the height warranted by the pressure of the steam; provided means were adopted to prevent the column acquiring additional length or weight after it had reached the 100. *Practically*, of course, such an effect cannot be obtained. The deflection of the cylinder cover is, apparently, a more weighty argument; but if analysed, is found to result from an entirely different cause to that assigned by Mr. P. Before, however, we investigate this point, I must request your readers to bear in mind, that in the engines Mr. P. experimented on, although the pressure of the boiler was about 100 inches of mercury, that of the steam in the cylinder was only about 75, with the steam full on; owing, of course, to the velocity of the piston being too great, or the induction too small to admit of the steam flowing in with sufficient rapidity.

Now, let us imagine an engine to be working under such circumstances, the piston at the top of the cylinder, and the steam admitted suddenly. The space between the cylinder cover and piston being small, in comparison to the size of the induction port, is almost instantly charged with steam of nearly equal pressure with that of the boiler; before this space can be enlarged, the *vis inertia* of the immense mass of matter, comprising the piston, beam, pump-rods, &c., and materials to be lifted, has to be overcome; and sufficient time will be required to do this, to admit of the pressure above the piston becoming equal to that of the boiler. This pressure is sufficient to bulge or force the cylinder cover outwards. As soon as the piston begins to move, the pressure gradually decreases from 100 to about 75, and the cylinder cover assumes its proper form. I need not enter into any elaborate argument to show why the cylinder cover is not deflected when the valve is opened slowly, as every one, who knows any thing of the steam-engine, knows there is a great loss of power occasioned by so admitting the steam—not owing to the loss of "percussive force," but owing to the wire-drawing and undue expansion, which is the natural result of admitting the steam too slowly.

If I am rightly informed, Mr. P. in his calculation of the effect produced by the Cornish engines, takes the maximum pressure of the steam in the cylinder at 27 lbs.; which 27 lbs. is continued during one-sixth of the stroke, the steam being expanded during the remaining five-sixths. If this be his mode of proceeding, he is not likely to arrive at a just conclusion, as to the relative quantities of steam consumed and work done; as it is obvious that the steam is exerting a pressure nearly equal to that of the boiler at the commencement, when the piston is moving very slowly; which pressure decreases as the velocity of the piston increases, and consequently expansion is going on during the whole of the stroke, instead of only during five-sixths.

Not being thoroughly conversant with the action of Cornish engines, I should incur a risk of error in speaking thereon; therefore, I wish it to be borne in mind, that the following remarks on the crank are not made in reference to them. My reason for speaking on this subject is in reply to an assertion of Mr. Parkes, that a crank engine cannot possibly realize the advantages gained by a non-rotative; and I see by a reference to the patent list, that a patent has lately been taken for machinery to be used as a substitute for the crank, probably with a view to obviate the supposed disadvantages assigned to it by Mr. P. Now, as far as I can perceive, a pumping engine, regulated by a crank and fly-wheel, would realize more advantage than a non-rotative, especially while the latter labours under such a palpable disadvantage as the one Mr. Parkes experimented on, viz. not admitting the steam with suffi-

cient rapidity to keep up a due pressure in the cylinder when the steam is full on. In a crank engine, the extreme slowness of the piston during the first part of the stroke, allows sufficient time for nearly the full pressure of the steam to be maintained in the cylinder; and consequently, much more may be admitted during one-eighth of the stroke, than Mr. P. obtained in one-sixth. I should imagine there would be considerable difficulty in arranging a merely reciprocating engine, in such a manner as to keep up a full pressure while the steam is on; as such a pressure cannot be maintained unless the piston is loaded so as to offer a certain modicum of resistance; and if the load be thus increased, the weak expanded steam at the end of the stroke will not be sufficient to keep the load in motion. With a crank and fly-wheel, both these disadvantages may be obviated: the slow motion of the piston at the commencement of the stroke, allowing the admission of nearly full pressure steam; and the momentum of the fly-wheel, acting, as it does, with a gradually increasing leverage from the middle of the stroke, admitting of the steam being expanded to any degree of rarity above that required to overcome the friction, &c.

Yours, respectfully,

J. BRITTEN.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

SIR SAMUEL BROWN, KNIGHT OF THE ROYAL HANOVERIAN GUELPHIC ORDER, COMMANDER IN HER MAJESTY'S NAVY, OF NETHERBYERS-HOUSE, AYTON, BERWICKSHIRE, *for improvements in the means of drawing or moving carriages and other machinery along inclined planes, railways, &c., and for drawing or propelling vessels on canals, rivers, and other navigable waters.* Enrolment Office, December 18, 1841.

The first part of this invention relates to a mode of propelling carriages by means of a ground chain. For this purpose a cranked axis, turning in suitable bearings upon the framing of the carriage, and driven by connecting-rods from the steam cylinder, carries a cog-wheel and a chain-wheel. Two other axes also carry respectively chain-wheels and cog-wheels, which are driven by the former. On motion being given to the machinery, a ground-chain is progressively picked up, and passing under the wheel on one axis and over the other, is laid down again, and the carriage thereby propelled along.

The second part of the invention consists in the application of similar machinery on board a vessel, for propelling it.

The claim is, 1. To a mode of propelling carriages by means of wheels or endless chains, worked by suitable gearing, and acting with a ground-chain; 2. To a mode of warping vessels by means of wheels or endless chains, worked by suitable gearing, and acting with a chain of single links, whereby one chain is rendered sufficient for the passage of vessels in opposite directions at the same time.

JAMES HENRY SHAW, OF CHARLOTTE-STREET, BLACKFRIARS-ROAD, JEWELLER, *for improvements in setting wheat and other seeds.* Enrolment Office, December 18, 1841.

These improvements consist in furnishing means by which given quantities of wheat or other seeds may be set at regular intervals apart. A frame is mounted on two running wheels; two smaller wheels are also applied to side frames in front of the machine, which admit of adjustment, so as to regulate the depth of furrow produced by the ploughs, which are fixed in the front rail of the framing by wedges. On the nave of one of the running wheels a cog-wheel is fixed, which, by means of a clutch-box, can be thrown into or out of gear, with a corresponding cog-wheel on the axis of a seed cylinder. This cylinder is divided into a number of compartments, corresponding to the rows of seeds to be deposited. Around each compartment there is an apparatus for regulating the quantity of seed, and depositing it at the prescribed distances apart.

The seed passes down rectangular tubes, the lower ends of which are kept closed by spring valves, which are opened at proper intervals, and to a proper distance, by a series of curved bars affixed to the machine.

The claim is to combining mechanical apparatus into a machine, by applying depositing apparatus, and suitable parts connected therewith, to a revolving cylinder.

WILLIAM CHESTERMAN, OF BURFORD, OXFORD, GENTLEMAN, *for improvements in filtering different liquids.* Enrolment Office, December 21, 1841.

Under this deceptive title we are presented with another new coffee-pot, which seems to us to be an inferior modification of the very excellent contrivance of Mr. Platow.

This coffee-pot is made of tin plate, with a wooden handle attached horizontally to one side of it; a hole is made in the bottom of the vessel, to admit a heater to enter a tube which passes up the centre of the pot. The ground coffee being placed in the vessel,

and boiling water poured upon it, the mouth of the coffee pot is fitted with a strainer, and the vessel reversed. The hot heater is then dropped into the tube, which causing the rapid generation of steam, forcibly expels through the strainer or filtering material, the clear decoction of coffee, which is received in a suitable vessel for serving.

The claim is to the mode of constructing apparatus to act as a filter, being inverted, and aided by the application of heat.

JOHN WHITE WELCH, OF AUSTIN-FRIARS, MERCHANT, *for an improved reverberatory furnace to be used in the smelting of copper ore, or other ores which are or may be smelted in reverberatory furnaces.* (A communication.) Rolls Chapel Office, January 21, 1842.

This furnace has two chimneys or flues, leading away in opposite directions from the circular basin or body of the furnace to two upright chimney-stacks, by means of which the requisite draft is obtained. A rapid current of flame, heated smoke, gas, and air, proceeds from the fire in a fire-place situated on one side of the furnace, over a low wall, called the fire-bridge, into the body of the furnace, at the upper part thereof, and, striking against the arched dome, is deflected or reverberated downwards upon the ores, or other matters lying on the floor of the furnace, and being divided into two currents, passes away to the chimneys. The heated gases, &c., are deflected down upon any ores, &c., which may be placed in the passages, which slope downwards towards the body of the furnace. The ores are fed into these passages from hoppers placed above, and as they become roasted or calcined, are pushed down into the main body of the furnace, by means of iron rabbles introduced through suitable openings made for that purpose.

Furnaces thus constructed are said to be applicable to the calcining or melting of copper or other ores, previously prepared and mixed in the usual manner.

The claim is to the improved reverberatory furnace before described; the novelty and the chief distinction between such improved furnace and those in common use being, that the current of flame, heated smoke, gas, and air, which proceeds, in the usual manner of ordinary reverberatory furnaces, from the fire-place, and over the fire-bridge, into the body of the furnace, (instead of proceeding onward away from that body by one flue or passage to the chimney, as is the case in ordinary furnaces,) in the improved reverberatory furnace divided into two separate currents, which pass away laterally from the body of the furnace in opposite directions, in order to go by two distinct flues or passages to the chimneys; in each of which flues or passages part of the ore, (regulus or imperfect metal,) which is to be operated upon may be placed, so as to receive a heating action from the divided currents of flame, heated smoke, air, and gas, passing through each of the said passages respectively; so that two flues or passages, both having ore in them, are heated by the same fire, and with an economy of fuel. The improved reverberatory furnace may have two distinct vertical chimneys; or the said two vertical chimneys may be brought together into one vertical stack or chimney, by means of suitable flues or passages extending from the lowest part of the two vertical chimneys, to lead into the lower part of the said one stack or chimney, if that mode is preferred.

WILLIAM WARD ANDREWS, OF WOLVERHAMPTON, IRONMONGER, *for an improved coffee-pot.* Enrolment Office, January 21, 1842.

Within the body of the coffee-pot is placed a perforated box furnished with a movable top, which is held on by a clutch and ring; within this perforated box, and connected with it, is a perforated pyramid or cone, the base of which communicates with a water-passage at the bottom of the coffee-pot; at the back of the coffee-pot, close to the handle, there is a forcing-pump fitted with a solid piston or plunger, and near the top of the pump-barrel there is a lip and cover, for pouring in boiling water. The piston being raised to the top of its working-barrel, boiling-hot water is poured into the lip, which flowing down the pump-barrel, passes along the water-passage, up through the perforated cone, into the perforated box in which the ground coffee had been previously deposited, and thence into the body of the coffee-pot. The piston is then forced down, which drives the small quantity of water contained in the pump-barrel through the coffee-box into the body of the pot, whence it can be drawn off by a spout of the usual construction.

The patentee claims "the improved coffee-pot, as described, whereby I am enabled to force the boiling-hot water, *of which the coffee is to be made*, by means of a solid piston and force-pump, through the coffee, while the coffee is contained in a fixed closed and perforated box."

Neither the mode of using, nor the advantages supposed to be obtained by this improvement, (?) are by any means clearly set forth in the specification. Whether the pumping action is to be continued for any length of time, or whether the magic influence of one small quantity of water forced through the coffee by manual pressure, while

another quantity has accomplished the same journey by gravity alone, is the wonder-working agent, the patentee sayeth not. One thing only is clear, that the patentee is to make such coffee by his cunningly contrived pot, as nobody before him ever made; for, whereas other people usually make their coffee from the berry so called, Mr. A. tells us he makes his "of boiling-hot water."

COPYRIGHT OF DESIGNS—CASE OF INFRINGEMENT.

At the Petty Sessions at Dndley, on Monday last, Mr. Jeffrey Finch, fender-maker, of that place, was convicted in a mitigated penalty and costs, for selling fenders whereon the registered design of Mr. James Yates, of Effingham Works, Rotherham, had been used. This proceeding took place under the recent statute for securing to proprietors of designs for articles of manufacture the copyright of such designs; and it is hoped it will operate as a caution, and prevent future infringements.—*Aris's Birmingham Gazette, Jan. 17*, 1842.

LIST OF DESIGNS REGISTERED BETWEEN DECEMBER 21ST, AND JANUARY 29TH, 1842.

Data of Registration. 1841.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Dec. 22	985	William Marr	Lock	3 years.
23	986,7	H. Longdon and Son	Fender	3
"	988	James Barlow	Steamer	3
"	989	H. Davies	Elliptograph	3
24	990	George Wadsworth	Spur-hox	3
"	991	Edward Perry	Vase	8
"	992	W. C. Stamp	Bath	3
"	993	The Falkirk Iron Company	Stove	3
"	994	H. H. Russell	Slate fastenings for roofs	3
28	995	Insole and Jones	Harness backband tug	3
"	998	John Jones	Compass watch	3
29	997	Plowman and Quarterman	Threshing machine	3
"	998	William Plowman	Reading table	1
30	909	James Eagles	Brush	3
"	1000,1	Thomas Hopkins	Carpet	1
"	1002	Kidston and Company	Jug	1
"	1003	Ditto	Bowl	1
"	1004	Ditto	Jug	1
Jan. 3	1005	Ditto	Plate	1
"	1005	W. W. Nicholson	Stove	3
4	1007	Thomas H. Ryland	Screw plate	3
"	1008	Ditto	Fastenings for trowsers	3
"	1009	Edward Ferry	Coal or coke-box	3
7	1010	William Hancock, jun	Nail ornament	3
10	1011,2	Woodwell, Gundell and Co.	Carpet	1
"	1013	Lewis and Co.	Parallel motion for pump work	3
11	1014,18	James Boswell	Stained paper	1
"	1019,20	Ralph Wilson	Button	3
12	1021	Miller and Baokler	Lamp post	3
"	1022,35	William Evans	Stained paper	1
"	1038,39	H. I. and J. Dixon	Carpet	1
14	1040	Lea and Co.	Ditto	1
"	1041	Joseph Fenn	Coach wrench	8
17	1042	H.Longdan and Sons	Stove	3
"	1043	Mrs. Sarah Cooke	Plate-warmer	3
18	1014	James Yates	Stove	3
"	1045	Ditto	Fender	3
"	1048	Thomas Glover	Ploughshara	3
"	1047	William Sibson Alderton	Pen holder	1
"	1048	John Beekett	Metallic plate	3
"	1049,61	H. N. Turner and Co.	Stained paper	1
21	1062,3	Southwells and Co.	Carpet	1
"	1084	Joseph Hoy	Railway signal hand lamp	3
24	1085	James Verily	Clog fastening	3
"	1066	Lea and Co.	Carpet	1
"	1067	Fleming and Neill	Cooking apparatus	8
26	1068	Mapplebeck and Lowe	Coal vasa	3
"	1069	T. Finnemore	Pen	3
"	1070	William Polyblank	Improved lamp	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 21ST OF DECEMBER, 1841, AND THE 27TH OF JANUARY, 1842.

John Watson, of Chorley, Lancaster, Gentleman, for improvements in the construction of filters used in the manufacture of sugar. Dec. 23; six months.

William Baillien, of Gloucester-street, Queen's-square, Bloomsbury, musician, for improvements in apparatus to expand the human chest. Dec. 23; six months.

William Robinson Kettle, of Waterloo-street, Birmingham, Accountant; Benjamin Wakefield, of Ryland-street North, Birmingham, civil engineer; and William Crosher, of Cumberland-street, Birmingham, screw manufacturer, for an improved bolt for building and other purposes. Dec 24; six months.

Montagu Macdonough, of St. Albans-place, Middlesex, gentleman, for improvements in spindles, flyers, and bobbins, for spinning, twisting, and reeling all sorts of fibrous or textile substances; and in the application or adaptation of either or all of them to machinery for the same purposes. (Being a communication.) Jan. 6; six months.

Edward Hall, of Dartford, civil engineer, for an improved steam-boiler. Jan. 11; six months.

Samuel Hearne Le Petit, of St. Pancras-place, Middlesex, for improvements in the manufacture and supply of gas. (Being a communication.) Jan. 11; six months.

James Chesterman, of Sheffield, mechanist, and John Bottom, of Sheffield, aforesaid, mechanist, for certain improvements in tapes for measuring, and in the boxes for containing the same. Jan. 11; six months.

Charles Wye Williams, of Liverpool, gentleman, for certain improvements in the construction of furnaces, and effecting combustion of the inflammable gases from coal. Jan. 11; six months.

John Tresahar Jeffree, of Blackwall, engineer, for certain improvements in lifting and forcing water, and other fluids, parts of which improvements are applicable to steam engines. Jan. 11; six months.

Richard Dover Chatterton, of Derby, gentleman, for certain improvements in propelling. Jan. 11; six months.

James Tons, of Newcastle-upon-Tyne, gentleman, for improvements in smelting copper ores. Jan. 13; six months.

Julius Bordier, of Austin Friars, merchant, for certain improvements in preparing skins and hides, and in converting them into leather. Jan. 13; six months.

Caleb Bedells, of Leicester, manufacturer, and Joseph Bedells, of the same place, for improvements in the manufacture of elastic fabrics, and articles of elastic fabrics. Jan. 13; six months.

Joseph Barnes, of Church, near Accrington, Lancashire, manufacturing chemist, for certain improvements in the working of steam engines. Jan. 13; six months.

Henry Waterton, of Winsford Lodge, Chester, Esq., for improvements in the manufacture of salt. Jan. 13; six months.

John Jeremiah Rubery, of Birmingham, umbrella and parasol furniture manufacturer, for improvements in the manufacture of a certain part of umbrella and parasol furniture. Jan. 13; six months.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in the construction of locks. (Being a communication.) January 15; six months.

John Thackeray, of Nottingham, lace thread manufacturer, for improvements in the process of preparing and gassing thread or yarn. January 15; six months.

Thomas Lambert, of Regent's-park, musical instrument maker, for improvements in the action of cabinet pianofortes. January 15; six months.

Edward Palmer, of Newgate-street, philosophical instrument maker, for improvements in producing printing and embossing surfaces. January 15; six months.

James Cole, of Youl's-place, Old Kent-road, brush manufacturer, for certain improvements in the construction of brushes. January 15; six months.

Cornelius Ward, of Great Titchfield-street, musical instrument maker, for improvements in flutes. January 18; six months.

William Tindall, of Cornhill, ship-owner, for a new and improved method of extracting or manufacturing from a certain vegetable substance certain materials applicable to the purposes of affording light, and other uses. January 19; six months.

Antoine Mertens, of the London Coffee-house, publisher, for improvements in covering surfaces with wood. (Being a communication.) January 22; six months.

William Baker, of Grosvenor-street, Grosvenor-square, surgeon, for certain improvements in the manufacture of boots and shoes. January 27; six months.

John James Baggaly, of Sheffield, seal engraver, for certain improvements in making metallic dies and plates for stamping, pressing, or embossing. January 27; six months.

Andrew Kurtz, of Liverpool, manufacturing chemist, for certain improvements in the manufacture of artificial fuel. January 27; six months.

Francis Marsion, of Aston, Salop, esquire, for improvements in apparatus for making calculations. January 27; six months.

Samuel Mason, of Northampton, merchant, for improvements in clogs, part of which improvements is applicable to shoes and boots. January 27; six months.

Gottlieb Boccius, of the New-road, Shepherd's-bush, gentleman, for certain improvements in gas, and on the methods in use, or burners for the combustion of gas. January 27; six months.

William and John Galloway, and Joseph Haliy, of Manchester, engineers, for certain improvements in machinery for cutting, punching, and compressing metals. January 27; six months.

Pierre Journet, of Dean-street, Soho, engineer, for improvements in steam-engines. (Being a communication.) January 27; six months.

Henry Benjamin, of Saint Mary-at-Hill, fish-factor, and Henry Grafton, of Chancery-lane, philosophical instrument-maker and machinist, for improvements in preserving animal and vegetable matters. January 27; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN THE 28TH OF DECEMBER 1841 AND THE 22ND OF JANUARY, 1842.

John Juckes, of Lewisham, Kent, gentleman, for improvements in furnaces or fire-places. Sealed December 28.

Montagu Mac Donough, of Saint Alban's Place, Middlesex, gentleman, for improvements in spindle flyers and bobbins for spinning, roving, twisting, and reeling all sorts of fibrous or textile substances, and to the application or adaptation of either or all of them to machinery for the same purposes. (Being a communication.) Sealed January 4.

Thomas Joseph Ditchburn, of Orchard-house, Blackwall, Middlesex, ship-builder, for certain improvements in ship-building, some or all of which are applicable to steam-boats, and boats and vessels of all descriptions. January 6.

Moses Poole, of Lincoln's Inn, Middlesex, gentleman, for improvements in preparing matters to be consumed in obtaining light, and in the construction of burners for burning the same. (Being a communication from abroad.) January 7.

William Petrie, of Croydon, Surrey, gentleman, for a mode of obtaining a moving power by means of voltaic electricity, applicable to engines, and

other cases where a moving power is required. January 7.

James Taylor, junior, smith and engineer, Turner's-court, Glasgow, for a self-acting machine for driving piles and stakes, and for other such purposes, to be wrought by steam or other power. January 10.

John George Bodmer, of Manchester, Lancaster, engineer, for certain improvements in the construction of screwing stocks, taps and dies, and certain other tools, or apparatus, or machinery, for cutting and working in metals. January 13.

William Petrie, of Croydon, Surrey, gentleman, for improvements in obtaining mechanical power. January 13.

Alphonse Rene Le Mire de Normendy, of Red Cross-square, London, doctor of medicine, for certain improvements in the manufacture of soap. January 13.

Henry Hough Watson, of Bolton le Moors, Lancaster, consulting chemist, for certain improvements in dressing, stiffening and finishing cotton, and other fibrous substances, and textile, and other fabrics, part, or parts of which improvements are applicable to the manufacture of paper, and also to some other processes, or operations connected with printing calicoes, and other goods. January 18.

John Lee, of Newcastle-upon-Tyne, manufacturing chemist, for improvements in the manufacture of chlorine. January 19.

John Thomas Carr, of the town and county of Newcastle-upon-Tyne, for improvements in steam engines. (Being a communication.) January 19.

Robert Stirling Newall, of Gateshead, Durham, wire rope manufacturer, for improvements in the manufacture of flat bands, and in machinery for the manufacture of wire ropes. January 20.

LIST OF PATENTS FOR IRELAND GRANTED IN DECEMBER, 1841.

J. C. Daniell, for improvements in the manufacture of manure, or composition to be used on land as manure.

R. Logan, for improvements in obtaining and preparing the fibres and other products of the cocoa nut and its husk.

Captain J. N. Taylor, for a certain method, or certain methods, of abating or lessening the shock or force of the waves of the ocean, lakes, or rivers, and of reducing them to the comparatively harmless state, known by the term of "Broken-water," and thereby preventing the injury done to, and increasing the durability of breakwaters, moleheads, &c., and also of adding to the security and defence of harbours, roadsteads, anchorages, and other places exposed to the violent action of the waves.

R. Holt, for improvements in machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids.

NOTES AND NOTICES.

Fire-proof Cement.—Mr. Martin, of Blackfriars-road, has invented a fire-proof cement, which has been already used at the Earl of Sefton's residence, in Belgrave-square, at Stafford-house, &c., and which, we are informed, is intended to be used by Mr. Barry, the architect, at the new Houses of Parliament.—*Court Journal.*

Mr. Barry has done himself a great deal of credit by his decision on this subject, and we shall be glad to find his example followed by other surveyors of public buildings. We would more particularly allude at present to the British Museum and National Gallery, the *literally* invaluable contents of which are in hourly danger of destruction from the combustible nature of the floors and linings of the walls, and the *tinder-ish* state in which they are kept by the hot air and water flues running under or alongside of the wood-work. Since Mr. Martin's fire-proof composition has been brought forward, there is no excuse whatever for exposing these, or any other of our public institutions, to the danger of conflagration. The composition alluded to is the same which Mr. Cubitt, the eminent builder, has employed at his extensive factory at Thames Bank, in place of wood, for almost every purpose to which the latter is applicable in buildings. It has been also used for floorings, to a considerable extent, in the new houses which Mr. Cubitt is engaged on in Belgrave-square and its neighbourhood.— ED. M. M.

Mostyn Foundry Marine Steam-engines.—On Thursday last a new steamer, called the *Taliesin*, was launched at the building-yard of Messrs. Eyton Brothers, at Mostyn, Flintshire. She is entirely owned by Messrs. Eyton; is intended to ply on the Liverpool and Mostyn station; and has been modelled so as to combine capability of stowage with speed. A pair of 45-horse steam-engines, for the *Taliesin*, are now in the course of erection at the Mostyn Foundry. These engines have been recently invented by Messrs. Eyton, being on an entirely new principle, combining extraordinary lightness with power and economy of space. The two engines weigh about 12 tons, have no beams, and only occupy about four feet, longitudinally, of the vessel's hold. They have another advantage in long connecting-rods, and the smallest possible amount of friction. These engines are equally applicable to steamers of the lightest as of the heaviest class, from a river boat drawing one foot of water to the first-class war steamer.—*Liverpool Albion.*

[We presume that the weight here assigned to the engines is *exclusive* of the boilers; but even with that qualification, it is surprisingly—indeed, we may almost say *incredibly*—small. We shall be glad to receive some further account of these engines.—ED. M. M.]

Electro-Magnetic Railway Controller.—A private exhibition of Messrs. Wright and Bain's Patent Electro-Magnetic Railway Train Controller took place on Thursday evening last, at the Royal Polytechnic Institution, Regent-street. The object of this invention is to prevent those dreadful accidents which so often occur under the present system of working railways. These improvements were illustrated by working models, which clearly showed that, in the event of any obstruction on the line, disarrangement of switches, or leaving open of cross-road gates, &c., timely warning would be given to the engineer; and, in the event of his not regarding it, a loud signal would then be given, and the train stopped without his aid, before it reached the point of danger.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 965.] SATURDAY, FEBRUARY 5, 1842. [Price 3d.

Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.

WRIGHT AND BAIN'S ELECTRO-MAGNETIC RAILWAY CONTROLLER.

Fig. 1.

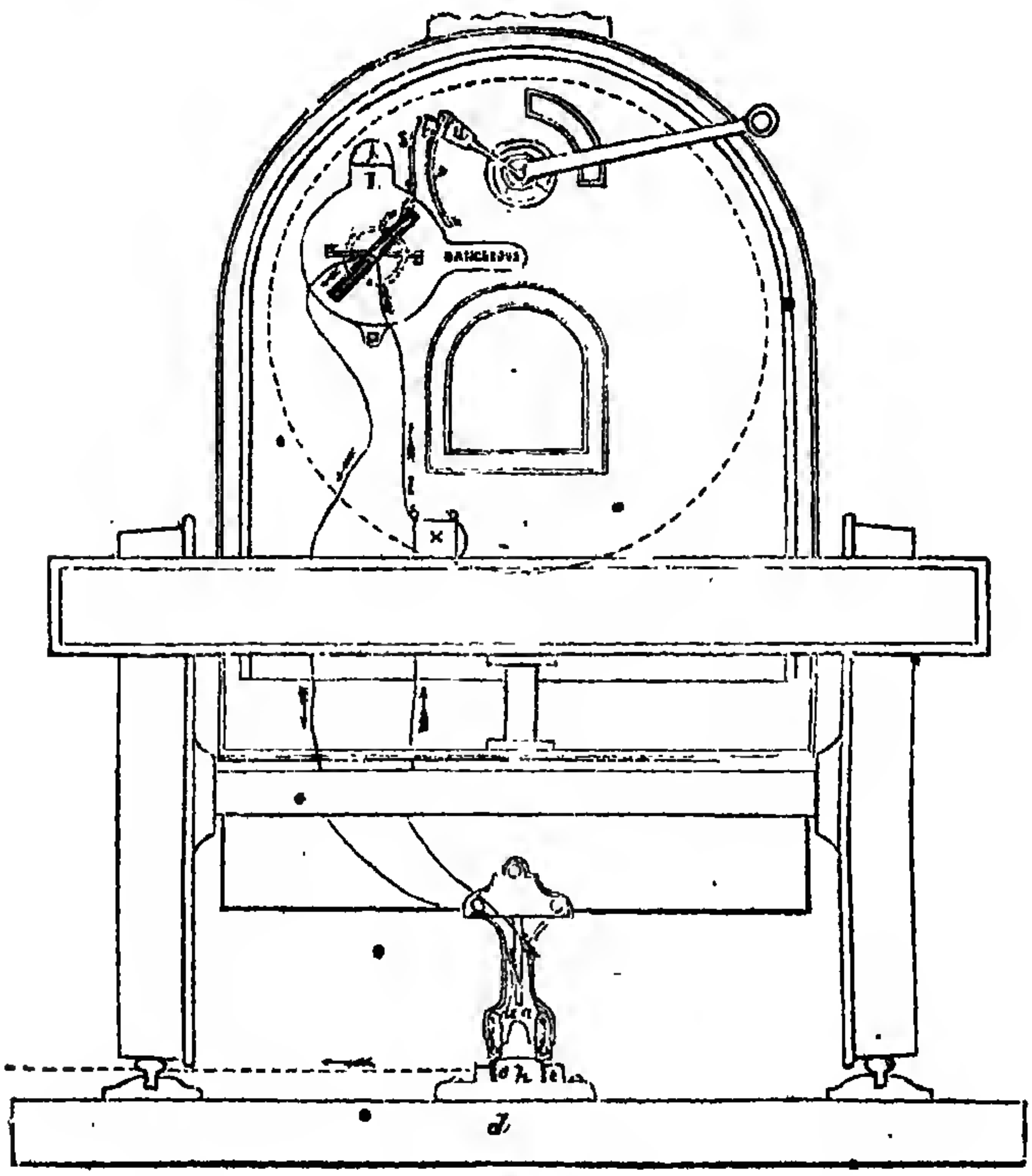
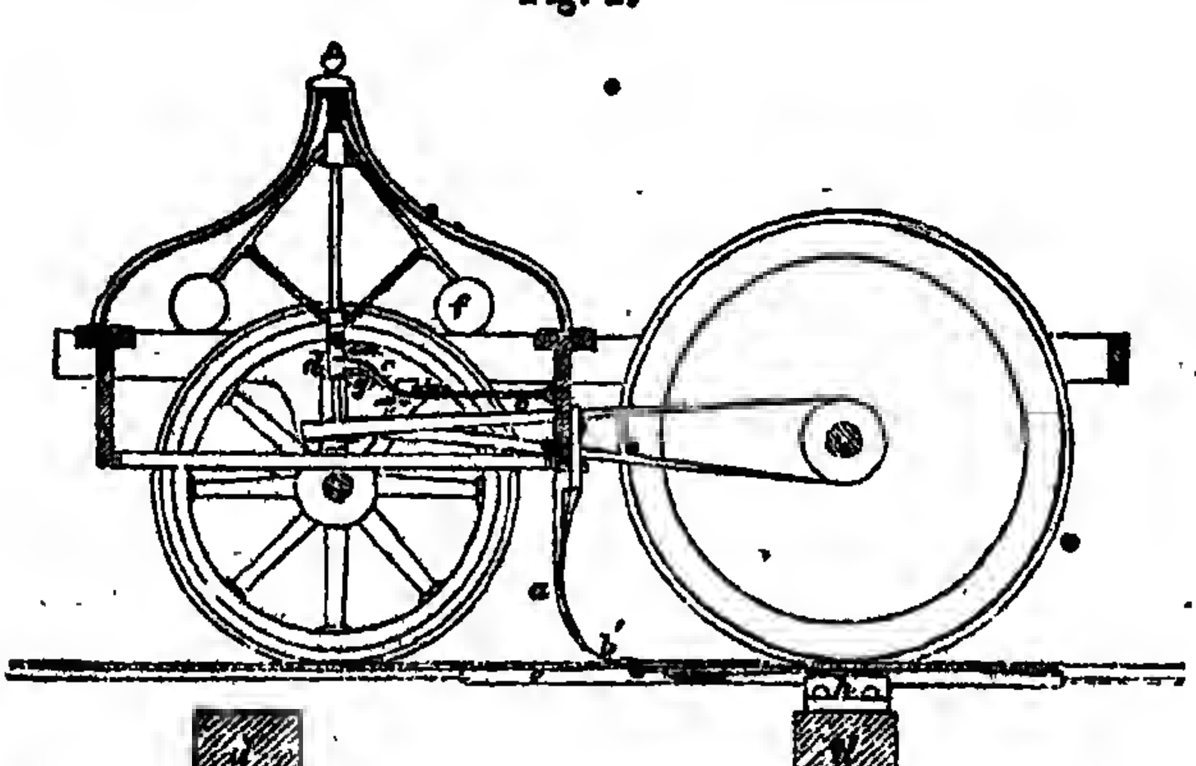


Fig. 2.



WRIGHT AND BAIN'S ELECTRO-MAGNETIC RAILWAY CONTROLLER.

The frequent occurrence of railway accidents, and the awful consequences attendant upon many of them, have directed an immense mass of intelligence to the study of means for giving increased security to railway travelling. Many plans for this purpose have been made the subjects of recent patents, and several of them have been very fully noticed in our pages. Our readers will, doubtless, have been struck with the similarity between several of these plans, as well in their mechanical details as in their principles of action. The plans hitherto published have, for the most part, consisted of various sorts of self-acting signals, by which the presence of danger is communicated in time to enable an engineer to arrest the progress of a train, and thereby avert the threatened danger. For accomplishing this object, various arrangements of solids and of fluids have been employed; but we have now to lay before our readers a more recent invention for establishing railway security, in which the most subtle of all agents is employed, viz., the electro-magnetic fluid.

This apparatus is the joint invention of Messrs. Wright and Bain, the latter of whom is already well known to our readers, and to the world of science, as the inventor of the electro-magnetic printing telegraph, the electro-magnetic clock, &c. It consists in the conveyance of the electric fluid from a battery attached to the locomotive engine, to a pilot engine by which the former is preceded at a distance of about a mile and a half. Should any obstruction in the road stop the pilot engine, or disturb its course, the current of the electric fluid is broken, and ocular notice is immediately given to the engine-driver; should this warning be disregarded, attention will be called by sounding a whistle, gong, or other alarm; and on this being still unheeded, the apparatus will then of itself turn off the steam, apply the breaks, and stop the train, without the interposition of the engine-driver. The invention is described generally as consisting of the application of the electro-magnetic current produced by the voltaic battery, to certain mechanical operations, principally through the temporary magnetism produced in soft iron by induction, or the power exerted by its attractive property as a magnet, and also the deflection of the coil and wire and magnetic needle. The patentees prefer to keep the needle fixed, and to make the coil to deviate, as the latter is not affected by the approximation of masses of metal. The manner in which this is effected will be made intelligible by reference to the engravings on our front page, wherein fig. 1 represents an end view of a locomotive engine, with the indicator attached to the boiler, and Fig. 2 a pilot engine, by which the making and breaking of the current, or electric circuit, is effected.

On the lower part of the fire-box of the locomotive engine, fig. 1, is bolted the leg *a*, to which two springs, *b b*, are screwed. In the centre of the sleeper *d d*, a block of wood, *h*, is pinned, in which are bedded two lengths of hoop-iron, or other suitable metallic connexion, *e e*, on which the springs *b b* slide when the engine is in motion. A side view of the same is shown in fig. 2, which is a section inside one of the rails and frame of the pilot engine, where *a* exhibits the side view of a leg fitted with springs, *b′*, which also constantly press on the metallic conductors *e e*. For the sake of distinctness, we will call these conductors or wires, which lead to and from the battery, positive and negative; the positive wire *l* goes from the battery *x* up to the coil of wire which it forms, then to the electro-magnet situated within the indicator at I, and thence passes down to one of the springs *b*, so that the electric current flows from the battery through the coil of wire around the magnet, while from the spring *b* it flows along one of the hoop stretchers to the spring *b′* of the pilot engine, fig. 2, and thence to the spring *c*, which rests on the moveable stem *d* of the governor *f*. It then returns through the spring *g* (which is similar to the spring *c*, and also rests on the stem *d*) down to one of the springs *b′*, through which it flows to the spring *b*, which is attached to the engine, fig. 1, and thence up to the battery. Thus the electric circuit is formed, the breaking of which gives the signals, &c. as before described; and the following is the way in which the circuit is broken by the occurrence of any impediment

on the line of rails:—The pilot engine precedes the locomotive from one to two miles, or such a distance as will enable the engineer to overcome the momentum of the train; should any obstacle cause the pilot engine to stop, the governor will of course stop also, and the balls descending will force down the stem *d*, until one of the springs *c*, comes on the part o of the stem, which is made of ivory or any other non-conducting substance, thereby instantly breaking the electric current, which had been transmitted, as before described, from the battery through the coil of wire and magnet. The result is, that the coil of wire not being any longer under the influence of the electric current, returns to the horizontal position, and points to the word "dangerous." A detent is at the same time released when a piece of clock work begins to run down, first striking a signal on a bell *k*, or gong, or sounding a whistle, and next, by means of the levers *s t*, releasing a weight *u*, which shuts off the steam. The clock work, or apparatus, by which the signal is sounded, steam shut off, &c., is so contrived as to be wound up by the motion of the locomotive engine, and is therefore always available; at the same time, by means of a very simple provision, over-winding is prevented.

In the event of any obstacle lying on the rails, the slipping of an embankment, or displacement of a rail, by which the progress of the pilot engine is impeded, or diverted from its proper course, the signalling and ultimate stopping of the train is effected with certainty. It is also proposed to connect the conducting wires with the gates at crossings, so that on a gate being left open, the pilot engine stops short before it reaches it, and thereby prevents accidents. The intersections of cross lines of railways are also arranged, so that on two trains coming up to the crossing at the same time, the one that is foremost stops the approach of the other until it has passed, and thereby prevents collision.

With respect to the transmission of the electric current of the voltaic battery, it has been proved by experiment, that for a distance of five or six miles this may be accomplished with certainty, and also that the conducting power of the wires is not affected by moisture; as it is contemplated that the distance between the pilot and the locomotive engine need never exceed two miles, it seems probable that this subtle agent may be applied in the manner proposed with every prospect of success.

The action of the models now exhibiting at the Royal Polytechnic Institution is highly satisfactory, and there would seem to be no reason to doubt the equal efficacy of the principle on the larger scale.—B.

HARPER AND JOYCE'S STOVES—MORE VICTIMS!

"For our parts, we would not sleep with one of these stoves in our bedchamber for one night, for ten times the sum we have heard mentioned as having been offered to the patentees for the invention. If the crevices of the windows and doors were sufficiently tight there need be no doubt as to the fate of the sleepers!"

Editorial remarks in *Mech. Mag.*, vol. xxix.

Sir,—The above prediction has just been most awfully realized, and two more human beings have been added to the list of victims.

The patentees of this precious discovery most positively asserted, that it gave out "*neither smell nor noxious vapour*;" the falsehood and fatal tendency of which assertion, I was among the first to point out to public attention. Notwithstanding the numerous cautions given in your pages, the patentees have continued to reiterate their assurances of the "safety and efficiency" of their stoves and fuel, although the dangerous character of these stoves and of the prepared charcoal has been demonstrated by yourself, as well as by M. Gay Lussac, Professor Everitt, and other first-rate chemists.

At an early period in the history of this invention, a gentleman who called at the establishment for the sale of these stoves was informed, "that a person had slept in a *confined apartment*, with one of these stoves burning all night, without experiencing the slightest inconvenience; he was likewise assured; *that if the prepared fuel was used*, not the slightest danger was to be apprehended!"

This is very wonderful—if true; and I can only say, that in my opinion the party had a very narrow escape. However, upon this fact (if fact it be), the patentees have continued to assert the *perfect safety* of *these stoves* and *this*

fuel, and one of the consequences of their heartless conduct is set forth in the following extract from the *Weekly Dispatch* of the 23rd ult.:—

"On Saturday morning last, much excitement prevailed in the neighbourhood of Church-street, Hackney, owing to the reported death, by suffocation from charcoal, of two youths in the employ of Mr. J. Long, the confectioner. From inquiries made, it appears that the unfortunate youths, whose names are Frederick Thomas Hersant, aged 19, and William Long, aged 17, were apprentices to Mr. Long. On Friday they complained of the coldness of their bedroom, which was situated over a bakehouse, and for the purpose of airing it, Mr. Long allowed them the use of a *small self-smoke consuming stove*, in which the PATENT CHARCOAL was burnt, with a strict injunction to remove it after the process of airing. This was done; but the poor fellows, anxious to impart warmth to their bedroom, and ignorant of the effect consequent on inhaling during sleep the noxious effluvia emitted from this charcoal, disregarded their employer's orders, and, in his absence, conveyed the stove into the room, and kindled a strong fire. They also, to make doubly sure their work of unpremeditated self-destruction, closed every aperture and crevice in the room, and, after making fast the door, retired to sleep—alas! to wake no more. Surprised at their non-appearance on Saturday morning, Mr. Long knocked at the bedroom door, and eventually, after many fruitless attempts to arouse them, forced his way into the room, and found them, to his surprise and grief, in an apparently lifeless state. Mr. Garrod, surgeon, was promptly in attendance, and pronounced Hersant to have been dead some hours. The other youth, Long, gave faint signs of animation, though little hope was entertained of his recovery. Mr. Garrod and the Messrs. Toulmin, surgeons, were unremitting in their attentions to him, but all that medical skill could devise proved unavailing. The unfortunate youth lingered until twelve o'clock at night (Saturday), when he expired. Monday an inquest was held at the Lion, Hackney, before Mr. Baker, on the bodies, and the above circumstances having been corroborated, a verdict of 'Accidental death' was returned."

The "infernal machine" which was moving to this catastrophe, was a Harper and Joyce's stove of the smallest size, which Mr. Long had purchased at a sale, where, with other rubbish, it had been brought "to the hammer."* The fuel employed, was the "prepared charcoal," purchased only about a fortnight before at Mr. Harper's shop in King William-street, City, and therefore perfectly *fresh* and *genuine*. Fortunately for science, Mr. Long was not in the habit of using any charcoal in his business, nor was there any other than the "prepared" upon his premises.

You pertinently asked (at page 208 of your 29th vol.) "If the death of any party had taken place in consequence of full reliance on the assurances in the prospectus of the 'new stove' as to the innocuous nature of the 'prepared fuel,' would not the patentees have been indictable for manslaughter *at the least?*"

How the jury could conscientiously reconcile their verdict of "accidental death," under the foregoing circumstances, with the evidence submitted to them, I know not—unless it was, that from the manner in which Mr. Long became possessed of the deadly instrument, he did not receive with it any "prospectus" or "directions for use," and could not therefore be said to have been misled by them.

Had there not been an implied reliance, however, upon the *superior safety* of the "prepared charcoal," Mr. Long would scarcely have sent from Hackney to the city for it, when plenty of common charcoal could be had at his own door.

Singularly enough, the very same paper from which the foregoing melancholy narrative is taken, contains in juxta-position to it, an advertisement of Joyce's stoves, in which they are described as such "excellent, useful, and convenient stoves, as no house should be without!" "Excellent"—for suicidal purposes; "useful"—for killing vermin; "convenient"—for disposing of burthensome relatives!

The most remarkable feature of the advertisement, however, is that no allusion whatever is made to the "prepared fuel;" which is fairly thrown overboard, by the following concluding notice:—"Improvements have been made by the addition of pipes or chimneys suitable for offices, shops, warehouses, &c., for the purpose of burning *coke!*"

In this form it ceases to be Joyce's *patent* stove, and becomes an Arnott's stove of the very worst description; the

* By placards posted about town, I perceive that "nearly three hundred" of these stoves are doomed to a similar fate at the Auction Mart on Thursday the 3rd of February, and following day!

worst as regards economy of fuel and production of heat, and also as regards its liability to those accidents for which this kind of stove has obtained an unenviable notoriety.

I am, Sir, yours respectfully,

WM. BADDELEY.

London, January 27, 1842.

MECHANICAL CHIMNEY SWEEPING.

Sir,—It is with considerable reluctance that I venture to express an opinion upon the communication of Mr. J. A. Emslie in your last number, on the subject of mechanical chimney sweeping—dictated, as that paper seems to be, solely by motives of humanity.

As the whole tenor of Mr. Emslie's remarks, however, are calculated to operate most prejudicially upon "the good cause" which he evidently has at heart, I must beg leave to place the subject in a more correct position before your readers.

Mr. Emslie sets out by supposing that at present we are wholly unprovided with any mechanical chimney, sweeping apparatus of a satisfactory character; he then goes on to enumerate defects (or supposed defects) of the apparatus heretofore employed for this purpose, and then suggests some machinery which he considers adapted to produce the object in view—a clean chimney.

But, that Mr. Emslie names Glass's machine, I should have supposed him as ignorant of its existence, as he evidently is of its superior capabilities. The fact is, that to this simple, but highly efficacious machine, we may with strict justice apply Mr. Emslie's own words, and say, that "*a more simple, safe, and efficacious plan for effecting the object in view, it will be difficult to find.*"

In the economy of its first cost,* facility in use, and universality of application, as well as in the cleanliness and efficiency of its operation, it leaves the suggested plans of Mr. Emslie immeasurably behind.

There is no chimney in existence capable of being swept by the *weighted brush*, that could not be swept far better, and with less injury, by one of Glass's machines; while there are innumerable chimneys to which the former is wholly inapplicable, that may, nevertheless, be very effectually cleansed by Glass's machine; among the other advantages of which must be enumerated, that of not requiring any previous provisions of pulleys or flue doors, except in the case of flues that are perfectly horizontal, and quite beyond the powers of the weighted brush.

The pneumatic chimney-sweeping apparatus of Mr. Emslie is really beneath criticism; and his proposition to insert a damper in the upper part of the chimney, so as to close it in case of fire, is calculated to cause the very injury it is proposed to obviate. This highly mischievous plan is sometimes resorted to, by covering the chimney pot with wet sacks, blankets, &c., and when effectually done invariably produces disastrous results. I have seen elegant rooms with every article of furniture contained therein very seriously damaged in this manner. Stopping the draft of air at the lower part of the flue, and thereby checking combustion, is highly beneficial; but closing the upper orifice and driving all the heated air, smoke, and other products of combustion down into the apartment, is productive of serious mischief.

I am, Sir, yours respectfully,

WM. BADDELEY.

London, January 31, 1842.

* The cost of one of Glass's machines complete, 30 feet in length, is only 2*l.* 13*s.*; 40 feet 3*l.* 2*s.*; and 50 feet, 3*l.* 11*s.*

PILBROW'S CONDENSING CYLINDER ENGINE—MR. PILBROW IN REPLY TO MR. CHEVERTON, MR. RADLEY, AND N. N. L.

Sir,—With your permission I will make a remark in answer to Mr. Cheverton's letter, (p. 439, in your vol. xxxv.,) which long since should have been done, had I been less engaged.

I think that Mr. Cheverton should not have made me "the occasion," if not "the subject," of that long communication, when he admits, in the first paragraph thereof, that "denies it not," speaking and quoting my remarks. We then both agree; and I must inform Mr. Cheverton, that I have ever given a maximum of my attention and dependance to practice rather than to theoretical deductions; and that when I made those remarks, I merely considered that the *data* for a calculation were the subject of

philosophy, and that if these were sound, the mathematics would not err in its conclusions—of course, meaning, that if the whole of nature's laws, that were brought into action in any particular case, were not considered, or any *made* to act a part that did not do so in practice, that this was a philosopher's error, and one that could not be attached to the mathematician; therefore that the errors, multitudinous as they are that have almost choked our history of science and theory, all originated in the data or false philosophy, and not in the mathematical process. Mr. Cheverton "denies this not;" we both are, then, of the same sentiments, and as there has been enough said about this matter without my assistance, I shall only now thank Mr. Cheverton for his attention to me and mine.

But before closing I would observe, in reference to Mr. Radley's paper, that his opinions and his testimony are a proof of the *correctness* of my theory and calculations, rather than, as Mr. Radley supposes, a contradiction. I did not rest my argument upon the speed of the piston when actually descending, but I pointedly expressed the fact of the *pause*—a pause that the crank engine can never partake the advantages of—a pause of one or two seconds after the eduction valve is opened to permit the steam to pass into the condenser, and be condensed before the steam valve is opened. This I know to be the fact, from accurate observation, and from the written communication of Mr. West, the engineer of Fowey Consols, which is printed in the pamphlet on my engine.

"The cause, nature, and real mode of operation of the pause," in the best Cornish engines, seem to me not to be very lucidly or accurately described by Mr. Radley, for upon the indoor stroke being completed, the equilibrium valve is opened by the termination of the action, and the piston immediately returns; by its approach to the top, the equilibrium valve is shut and the eduction valve opened, then one, two, or more seconds transpire, (according to the quantity of water necessary to be pumped,) before the cataract or time-divider releases the steam valve, and thus permits its opening, when the vacuum is already formed as I have stated. How Mr. Radley can doubt the utility of the pause, or even suppose it an evil, I must leave your readers to judge, who so frequently have had the action of these engines laid before them. Mr. Radley should not *theorize* upon the speed of the piston alone, in reference to me and mine, but with it consider the steam's action and nature under the piston in each engine at those points.

I am, Sir,

Yours respectfully,

JAMES PILBROW.

The Green, Tottenham,
January 24, 1842.

P. S.—As I was going to post the above, I saw in your last, (No. 963,) a paper from Mr. Cheverton and N. N. L., which, with your permission, I will briefly notice.

In the passage directly referring to me, Mr. Cheverton uses these sentences: "Mr. Pilbrow's entire faith in it," &c.; "the sanguine, but deceptive expectations," &c.; "not being himself, perhaps, a mathematician;" "*blind indiscriminating admiration*," &c. &c. &c. These various expressions are certainly not very complimentary to me or my abilities; and as Mr. C. knows, evidently, but little how far such are justly bestowed, he should not be so free in his allusions. Nowhere, I believe, in my papers or writings can be found any thing like "entire faith" in the hyperbolic curve, for I have merely considered that my engine offered the advantages of expanding the steam as low as should be found in practice economical—*not further*—though that was not said to be my object in the invention, but merely named as a minor advantage attending it. As to my "sanguine, but deceptive expectations," Mr. C. should first ascertain how sanguine I am, and next prove, or wait to see, how deceptive my expectations are, before he writes so positively, for in the whole of his voluminous observations, he has not in the slightest degree affected my engine. The next quotation, perhaps, is a matter of opinion or comparison, and therefore not likely to be decided to the satisfaction of all parties, nor usefully to any one, except to myself, who am satisfied upon the matter, for I find I am mathematician enough for all my purposes, which partake of as much practice as theory. As to "blind indiscriminating admiration," I can but feel obliged to Mr. Cheverton for such a compliment to my discretion and discernment, though I did not know that I had, in my late observations upon the subject which gave rise to such discussion, so shown my inability and ignorance.

In answer to N. N. L.'s 1st point, I beg to say that it is so, or we should alter the power of an engine by altering the stroke, though the consumption of the steam and all

else remained the same. To the 2nd I would first observe, that in the common engine every *alternate* stroke has to eject the condensement, therefore there must be some irregularity here; but in mine, half that quantity is ejected at the termination of each stroke, (calling, here, *half* a revolution a stroke.) As to the injurious effect of ejecting the condensement in so short a period by a large piston, "when the crank is in the worst possible position to carry on the movement of the engine," I must say I consider the contrary. Those well acquainted with the steam-engine, and its precise regulation, know that it is desirable that all the momentum and elastic force of the steam, above the amount necessary to simply overcome the friction of the engine, should be taken from it before the turn of the stroke, so that it should not be expended upon the matter of the machine itself. To accomplish this, it is the practice in many of the best engines to let in the steam upon the eduction side of the piston, before the stroke is quite completed, or in shutting the late eduction valve, and opening the contrary, prior to the turn of the piston, to bring all to a perfect and positive easy rest. Now, such proceedings are accompanied with loss of duty and steam; but when the engine is properly regulated, the momentum acquired by the descent or ascent of the pistons, and all the machinery therewith connected, will be taken up by force necessary for the expulsion of the condensement, &c., to the atmosphere. This action will not be a sudden jerk or concussion, as some have supposed, (as I have before fully explained,) but a gradual oozing, rather, of the condensement; when the momentum of the matter has the greatest power over the cranks, instead of the worst; when the crank may have to move twelve times as fast, and twelve times the distance of the condenser piston, which gives, of course, that proportion of mechanical advantage. If N. N. L. doubts the accumulation of power, or a concentrated force doing as much as a "diffused" force, let him think of the various stamping machines. As to that part relating to the better vacuum and the accumulation in the condenser, although N. N. L. has in great measure answered himself, and saved me the trouble, I shall simply say, that when there is a separate condenser, according to the proportion the same bears to the air-pump, so will the accumulation of gases be; for if the air-pump is of the same capacity as the condenser, then must there be, at the time the air-pump makes its stroke, double the quantity thrown in by the steam cylinder and injection *each* stroke, or the air-pump could not take out as much as was thrown in; and when the air-pump is only a single-acting one, this accumulation is again doubled. All this I have said over and over again, and nothing but this can be inferred from it; not that I suppose less is taken out than is thrown in. I am obliged, however, to N. N. L. for his notice, and shall be happy to meet him again; if he is not satisfied with my hasty reply.—J. P.

PILBROW'S CONDENSING CYLINDER ENGINE.

Sir,—This invention has been so much discussed in your pages, that I should not join in it, but for my promise some time back, particularly as Mr. Pilbrow has, I think, answered satisfactorily the objections made to its principle. Whether, however, there will be that perfect equilibrium necessary to give it so great a superiority over the present engine, is a point that practice alone can determine, though I do not see any theoretical law to prevent it.

In Mr. Pilbrow's reply to my question, respecting the consumption of fuel by the best marine engines, he has shown the difficulty of determining the quantity with any accuracy, owing to the frequent variation of the actual power by cutting off the steam at different parts of the stroke. I regret I cannot help him to a nicer appreciation; but there are few facts taken with sufficient accuracy to determine the real amount; and it is to be lamented that the suggestion of one of your correspondents has not been adopted, and the returns of fuel consumed made in the form of his log. Until this is done, I think no dependence can be placed on bare statements of only 5 lbs. per actual horse power, from whatever quarter they may come; for I have little doubt that this return has been made from the total quantity of coals consumed on a voyage, calculated upon the extreme actual power, worked to the utmost, when the diagrams have been taken, but which extreme has not been continued more than one-fourth the whole distance.

Although I think it will be found, on a proper comparison, that, making allowance for the gain in duty by expansion, the engines of the present day consume, on the average, nearly as much coal as the average of Mr. Watt's engines, there is certainly not so great a difference be-

tween the cylinder exhaustion and condenser vacuum of the *best* modern engines as in those of Mr. Watt; and the apparent improvement in modern practice is so great, that it ought to give a corresponding increase of duty, but it does not. Either the results, therefore, of Mr. Watt's engines, given by Mr. Farey, are inaccurately reported, or no reliance can be placed upon the vague and ever-varying assertions of consumption of the present engines. Whatever may be the cylinder exhaustion of the average of engines, the best, using steam expansively as low, nearly, as it can be used, are within three-quarters of a pound of the condenser vacuum; an approximation as near to perfection, probably, as the action of the steam-engine will permit. But I certainly agree with Mr. Pilbrow, that this excellent evacuation is only obtained by an equal loss of steam power, by opening the exhausting valve before the completion of the stroke; so that there is a total loss equal to 1¼ lbs. on the square inch, even in the best engines. Assuming, then, that Mr. Pilbrow's engine will maintain an equilibrium throughout the stroke, there can be no doubt, I think, that it will be superior to the most excellent marine engine that can be made, to the extent of 1½ lb. the square inch, in this particular, and probably to half a pound more for a better extreme vacuum, giving a total gain of 2 lbs. That such an invention must inevitably supersede the separate condenser engine of Mr. Watt, I see no reason to doubt, and I cannot give the talented inventor higher praise. It certainly has the merit of being the most original, as well as the soundest based improvement on the steam-engine since 1765, amidst the thousand attempts made since then to improve Mr. Watt's. S. has justly observed, that Mr. Pilbrow's engine is contending with a substantial, not a shadowy defect in the present engines; and as it is yet more simple than Mr. Watt's, and cheaper, it seems to me that Mr. Pilbrow may claim the merit of having brought the reciprocating engine to the highest perfection of economy in fuel that its nature is capable of. It seems to me that the condensing cylinder engine is a valuable contribution to mechanical and philosophical science.

To prevent any jar, Mr. Pilbrow will probably find it better in practice to increase the area of his condensing cylinder, (keeping the capacity, of course, the same as the steam cylinder,) as its speed will be double that of the present air-pumps, which might render the discharge of the condensement somewhat inconvenient. This additional speed may prevent the speed of the piston being increased to 400 feet a minute, as Mr. Pilbrow contemplates, to obtain double the power in the same space.

There are now four inventions before the public, of the very highest importance to steam navigation; sound in principle, and, except the first, amply confirmed by practice. The condensing cylinder engine of Mr. Pilbrow; the condensation by injection, to prevent incrustation, of Mr. Symington; the prevention of smoke of Mr. C. W. Williams; and the screw propeller of Mr. Smith. Britain, it is gratifying to see, still maintains her station, the first in the mechanical and useful arts. She has now put at the disposal of commerce new means of extending it, of removing many acknowledged evils of steam navigation, and yet what an amount of prejudice has talent to overcome! People will not believe their sight! Every thing changes—states, cities, empires, nations, the earth and sea—all progressing to some wondrous close; but the human mind remains "cribbed, cabined, and confined," bound up in prejudice, and we see now in operation what so long retarded the introduction of Mr. Watt's engine, three quarters of a century ago. Is it written that the mind alone shall never progress from a bondage that has in all ages debased it!

I am, Sir, your obedient servant,

SCALPEL.

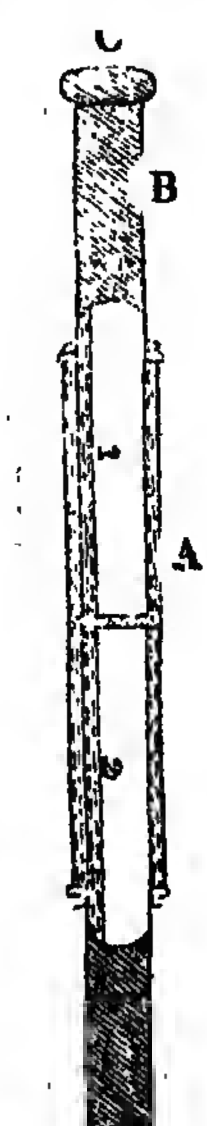
January 29, 1842.

MALLET'S HYDRO-PNEUMATIC BUFFERS—IMPROVEMENT SUGGESTED.

Sir,—It is with some degree of diffidence that I come forward to suggest an improvement in the invention of a practical engineer, like Mr. Mallet; who may be supposed to have well considered the precise bearing and effect of his combinations, and to have adopted the best and most appropriate means, for making his invention practically perfect. I make this observation, preparatory to referring

to a part of Mr. M.'s ingenious hydro-pneumatic buffers, described in your No. 956, which has struck me as far from exhibiting the adaptation of well devised means to obtain the best results. I allude to the means adopted by Mr. M. for preventing the plunger being driven out of the cylinder by the rebound or recoil of the compressed air, which is done by projecting fillets cast on the inner end of the plunger, which impinge against the cylinder on the recoil of the plunger. But, so far as I am able to understand Mr. M.'s description, his invention contains no provision for preventing or counteracting the sudden shock or concussion with which the inner end of the plunger must thus be driven against the cylinder by the reaction of the compressed air.

A very simple expedient offers itself, by which the plunger may be as effectually prevented from being driven out of the cylinder, as it can by fillets or any other mechanical resistance, while at the same time the possibility of any shock or concussion is entirely obviated. For this purpose it is only necessary to employ a *double* hollow plunger, divided into two equal parts and working through both ends of the cylinder. The following fig. and accompanying description will render this more plain.



A is the cylinder, truly bored, and somewhat longer than the double (and partly) hollow plunger B, which works through both ends of the cylinder in stuffed collars, and is divided into two equal parts 1, 2, by a metallic plate or diaphragm, which projects so as to be capable of being formed by any appropriate means into a piston, working smoothly in the cylinder. One end of the plunger is armed with the usual buffer-head; C, the other end, is plain and concealed in the frame work of the carriage. The apertures of the two air chambers of the plunger, communicating with the cylinder, are near to each side of the piston and in the lowest part of the plunger.

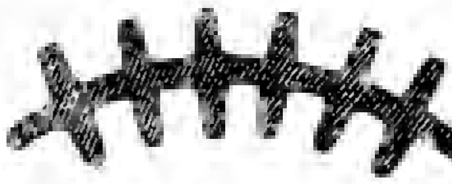
Now it is obvious, that if the air in each division of the plunger be in an equal state of compression, the latter will necessarily be in the position represented in the drawing with the piston exactly in the middle of the cylinder, and the buffer at rest. On coming into collision with another body, the buffer will be driven in, more or less, according to the force of the collision, and the air in the farther chamber (2) of the plunger compressed accordingly. But whatever may have been the force of the collision, and degree of compression, the plunger cannot, on removal of the impulsive force, fly back or rebound with a sudden shock against the end of the cylinder as in Mr. M.'s arrangement: for as soon as the piston passes the middle of the cylinder on its return, the air in the near compartment (1) of the plunger begins in similar manner to undergo an increasing compression, which will not only destroy the force of the recoil, before the piston comes near the end of the cylinder, but re-act on the opposite end, in its turn; thus establishing an oscillating motion of the two ends of the plunger, until the buffer finally comes to rest, with the piston in its old position in the middle of the cylinder.*

As a concluding suggestion, let me ask whether oil would not be a better fluid for using in the cylinder than water? Oil would lubricate and make the different parts of the buffing apparatus work with greater ease and delicacy of movement; and the freezing point of certain oils is considerably lower than that of water. The quantity required for each buffer would be trifling.

N. N. L.

* January, 1842.

MR. C. W. WILLIAM'S IMPROVED BOILERS —IMPROVEMENT SUGGESTED.



Sir,—Will you permit me to recommend, through the medium of your journal, the adoption of ribbed plates, as represented in the above sketches, in lieu of Mr. C. W. Williams's cylindrical conductors, one portion of which that gentleman admits there is a difficulty in introducing, on account of their interfering with the removal of deposited matter. These ribbed plates would admit of a great extent of heating surface, and would offer no greater obstacles to a cleansing process than common ones.

I am, Sir, your obedient servant,

C. W.

PROTECTION OF THATCHED COTTAGES FROM FIRE—ARCHIMEDEAN SCREW PROPELLERS—THE BUDE LIGHT, &c.

Sir,—In my letter of last week, on the prevention of fires, I forgot to mention an effective means of rendering the thatch of cottages, barns, &c., incombustible. It consists in soaking the thatch with whitewash made of lime, or whitening and size, in the usual way, to every four gallons of which is added one pound, or rather more, of alum. Alum would suffice by itself, but the rain would wash it off. The lime and size form a film over every straw, insoluble in water. In July, 1835, I covered a quantity of straw and perfectly dry furze with this cheap preservation, and, after it was well dried in the sun, I endeavoured in vain to make it burn. I do not pretend that this wash can, with expediency, be applied to the *vertical sides* of a *hay-stack*, because, first, it would not penetrate sufficiently; secondly, the quadrupeds would not like it. Whether the wash would be best applied to the straw before being bound into a thatch, or afterwards, a trial or two would determine. If deal boards are well soaked in a strong solution of alum, I should not like to have the task of setting them on fire with the best *roche à feu*, (in English, wild-fire, or carcass composition,) even my own, which Woolwich authorities have told me is stronger than Congreve's; it burns a hole through an iron plate, and consumes an iron bolt, a quarter of an inch diameter, in a few minutes.

Whilst I have my pen in my hand, I will take the liberty to touch upon another trifling thing or two, until I have time and means to give you something better, which will be soon.

"I hope I don't intrude," if I venture to say a word or two about the *Archimedean* screw propeller for steam-vessels. In your Number 961 there is a long account of "A Trip in the Archimedes" steam-ship. Now, although I have already mentioned the fact, I do not think it impertinent for me to take the liberty of repeating it, *i. e.* that it was I who presented the plan, with models and drawings of this said screw propeller, to the Duke of Clarence, Lord High Admiral, in 1837. Admiral Sir Edward Owen was then his secretary, or chief counsellor; I have his letters to show that my plan was rejected as inefficient! Many other things, which on occasion of the first war will surprise the belligerents, were also disregarded. So much for that.

Another item is, that I see a patent taken out for a light caused by the projection of a jet of hydro-oxygen gas on to a cylinder of lime. It was Mr. Goldsworthy Gurney who invented that mode of producing an intense light, at his residence of Bude, in Cornwall, in the year 1825—at least, that was the year in which I first saw it. This light afterwards got the name of the "Drummond Light"—how, I do not know: but Lieutenant Drummond was a gentleman well connected, and belonging to the British service!

The season and the weather prompt me to write a word on humidity. In 1816, I lived for some time near Tonbridge-wells, in Kent. In very dry summer weather, I observed patches of grass quite green, while others were brown—dried up by the sun. I thought it right to examine the cause, and, by a few strokes of a spade, I found that there was a stratum of chalk in contact with the roots of the grass. This guided me

to several reflections. I thought that chalk had a greater disposition to attract and retain the moisture of the atmosphere than other earths, and I have still reason to be of that opinion. I also observed that the large earth-worms, (lombrici,) never came up to defile the turf when it was upon a layer of chalk. So the first application of my remarks was to persuade my friends Mr. Campfield, Mr. Saint, Mr. Woodgate, the banker, and some others, who had their wives' and daughters' shoes daily soiled by the worms' projections on their lawns, to allow me to take up the turf, and replace it, after putting under it a thin stratum of chalk, broken about as fine as the coal used in smiths' forges: but the finer the better. I did all this in June, 1816, and not a worm ever came up afterwards; besides that the turf always retained its verdure, in the driest weather. Some years after, I observed on my garden walks, during a frost, especially when conjoined with fog, a circumstance which went some way to confirm me in my guess at the humidity-attractive disposition of chalk. I observed that a piece of chalk, exposed to the frost, accumulated around it more than five times its own weight of ice, and after a few frosty foggy nights, the bit of chalk became as a speck in the centre of the surrounding ice. After frequently remarking this fact, I bethought me of trying whether other substances would become equally covered with ice, under similar circumstances. I placed in propinquity, on the same path in my garden, bits of wood, orange-peel, cork, marble, iron, lead, and glass, all of the same sizes and shapes. I have not now access to my memoranda on this subject; but, as far as I can remember, the iron and lead accumulated no ice; the cork scarcely any; the orange-peel a little; the marble rather more; the wood, (deal,) a little; but the chalk, after a few days' and nights' exposure, was surrounded by at least six times its own weight of ice. I leave this experiment in the hands of philosophers to try at a cheap rate.

Now we must teach the ladies to skait, without the possibility of a fall whilst learning. In 1816, I had constructed some bell-shaped things of wicker-work, just fitting round the chest, under the arms, but expanding at the bottom to about four feet diameter—it might be more. Shoulder-straps prevent its touching the ice; but upon a trip which, *sans* the basket go-cart, would have been a fall, the machine, (if we may so call it,) rests and slides upon the ice, supporting the lady under the arms on a well-padded rim. This is no joke, for I put it to a successful test at Groombridge, in Kent, in 1816. However, I do not suppose that the ladies will avail themselves of the suggestion.

I hope that my next letter will contain something better than the trivialities of this. By the by, Sir, do you know—I dare say you do—the origin of the word "*trivial?*" The ancient Roman roads were formed of a carriage-way, and a foot-path on each side, as are most of ours; hence they were called *tri viæ*, or three ways. But the word "trivial" used to mean, with the ancient Romans, any thing well known, and common, and spoken of on the high roads, or *tri viæ*. The triumphal arch at Hyde-park-corner sins sadly in having only one centre passage for carriages, which formation makes it look very heavy. All Roman triumphal arches have three openings—*tri viæ*.

I have the honour to be, Sir,
Your obedient
F. Macerone.

January 20, 1842.

GREAT REDUCTION IN COST OF COPPER COILS FOR ELECTRICAL MACHINES.

Sir,—Being anxious to try some experiments on voltaic electricity, and to construct a large coil machine, but, for want of pecuniary means, unable to procure the requisite quantity of "insulated copper wire," it occurred to me that fine tow might be so thrown on as to answer the intended purpose. I immediately applied to Mr. Dinmore, rope manufacturer, at Woolwich, and suggested the possibility of effecting my object by stretching the wire from the wheel, and giving it a rotary motion, while it was fed sideways by a person walking: the experiment was tried, and found to answer admirably. Thus, by this means, an immense length of wire can be covered at a most insignificant cost. To render it more compact and secure, I give it a coat of some resinous varnish after each coil on the reel. When a secondary wire is required, you have only to throw them together by the ordinary method of spinning twine.

By reference to the undersigned, any quantity of this wire can be procured.

J. Walker.

Woolwich, January 11, 1842.

THE MUSOTON.

Cases are sometimes met with, in which, from the improper use of acoustic instruments, or from a sudden and very loud noise, the *membrana tympani* is rendered concavo-convex in an improper sense. To remedy this, Mr. John Harrison Curtis, the surgeon to the Royal Dispensary for Diseases of the Ear, has constructed an instrument consisting of a bag of caoutchouc, with a large ivory bowl attached to it and pierced in its centre, with an aperture communicating with the interior of the caoutchouc bag, to which he has given the name of *the Musoton.* By emptying the bag of air, and then applying the bowl over the ear, such a force is exerted by it on the air being again introduced, that the membrane is drawn out and restored to its natural condition. The bowl (see prefixed engraving) is connected to the caoutchouc bag by a long ivory nipple on its upper surface, on which the caoutchouc is securely fastened. When applied over the ear it is perfectly air-tight, the ivory bowl being cut expressly to fit the shape of the parts circumjacent to the auricle. The instrument is also very efficient in dry cupping, and from its simplicity it is likely to prove very useful and convenient.

THE BUDE LIGHT.

Sir,—It appears probable that the Bude-light will come into considerable use for purposes of general illumination, and probably in many places where the gasometers and apparatus necessary for generating the gas may be inconvenient. To obviate this, the old Portable Gas Company should look out their apparatus, as it seems to me a fair opportunity offers itself for them to make some use of what failed when coal gas was employed, owing to the partial decomposition of the gas, an effect which would not take place in the case of oxygen, as it did with carburetted hydrogen. If you think the preceding hint for the use of portable vessels of oxygen gas likely to interest your readers, I shall feel gratified by its insertion.

I remain, Sir, your obedient servant,

E. M. I.

London, November 1, 1841.

CEMENT FOR SILK.

Sir,—Having from its commencement been a reader of your valuable publication, I trust to my no small profit as regards scientific research,—I shall feel greatly obliged if, through your numerous readers, I could learn whether there exists any kind of cement for silk, in pieces? I have gone through your work, and can discover nothing, beyond some propositions for forming an Indian-rubber menstruum for a purpose analogous, but the plan seems imperfect. I once met with an aëronaut who informed me that he had such a preparation, and could, moreover, encase his balloon therewith, so as to prevent the escape of the gas; at all events, I should be glad to know if such an article, as regards the adhesive principle, can be purchased, and where?

I remain, Sir,

A Constant Reader.

November 16, 1841.

CASTING OF SPECULA.

Sir,—In No. 697, (December, 1836,) of the *Mechanics' Magazine*, your ingenious correspondent, Mr. Lassell, gave your readers a very masterly essay on the casting of specula. I have long been expecting Mr. Lassell would extend his essay to the art of

figuring and *polishing*, which is by far the most difficult branch of art. If he would favour the readers of your work with the other part of the process, I do not hesitate to assert, that the *Mechanics' Magazine* would be in possession of the very best method of casting, grinding, polishing, and figuring specula for reflecting telescopes, that has appeared in print.

I remain, Sir, your obedient servant,

ROBERT JONES.

Newcastle, January 19, 1842.

P.S.—Perhaps Mr. Lassell would favour us with a description of his "Observatory" lately erected at Starfield, near Liverpool.

IMPORTANT PATENT LAW CASE.

Crane v. *Price and others.*

This case, of the greatest importance to all patentees, as well as to the particular parties, and to the iron trade in general, occupied the attention of the Court of Common Pleas during three days of last week. The plaintiff's patent, dated 28th September, 1836, was for an improvement in the manufacture of iron, and the specification claimed as the invention, "the application of anthracite, or stone-coal, combined with a hot air blast, in the smelting or manufacture of iron from iron-stone, mine, or ore."

At the trial, before the Lord Chief Justice Tindal, the verdict was found for the plaintiff, subject to a special case.

Mr. Sergeant Bompas and Mr. Rotch for the defendants.—There has been no infringement of the plaintiff's patent. The defendants admit that they have used anthracite mixed with common coal, but what the plaintiff's specification claims is, the use of anthracite alone. To constitute an infringement of the plaintiff's patent, the anthracite must be used either alone, or with such a small admixture of ordinary coal as would be merely a colourable evasion. The mere use of anthracite is not new. In some parts of the coal fields, the anthracite is so mixed up with common coal, that the use of some portion of it along with the other coal could not be avoided; and that some use has been made of it appears from the specifications of several patents. As, for instance, of Martin's patent, June 23, 1804; of Harper's patent, August 28, 1824; of Philip Taylor's patent, February 28, 1826; of Botfield's patent, April 2, 1828. The anthracite could only be used under peculiar circumstances; it could not be used at all with equal advantage; but some use of it could be made. Now, the defendants have used anthracite with coke, in the proportion of about 5 cwt. of the former to about 9 cwt. of the latter. It is impossible to call such an use of anthracite an infringement of Mr. Crane's patent, which is for making iron with anthracite as the sole fuel. The defendants have never used anthracite alone, and it cannot be said that the use of it mixed with coke in such a proportion is a mere colourable evasion. The plaintiff is in this dilemma. If his patent is for the use of stone-coal alone, without any admixture of other fuel, then the defendants have not infringed it; if, on the other hand, it is for the use of stone-coal in general, whether alone or mixed, then it is void for want of novelty.

Next come two questions, which though technically distinct, do in fact involve each other—is the plaintiff the first inventor? and is the subject-matter of his patent a new manufacture within the statute? Mr. Neilson had already a patent for the hot-blast, which had been extensively used under license from him; and except by him, or under license from him, there is no evidence of any hot-blast whatever having been used in the kingdom. The plaintiff had himself taken out a license from Mr. Neilson. How, then, does the plaintiff's case stand? Mr. Neilson, by his specification, tells all the world, the plaintiff among the rest, that this hot-blast is an invention of the greatest importance for the smelting of iron. The plaintiff tries it with anthracite, and it succeeds; and then he says, "This is my invention—I will have a patent for it." But Mr. Neilson's patent is not for the use of the hot-blast with bituminous coal, or with any other particular sort of coal; it is for the use of it to blast furnaces, all furnaces whatsoever. Here is no new manufacture, no experiment was tried, no expense gone to; Mr. Crane takes out a license to use Mr. Neilson's hot-blast, tries it with anthracite, finds, as Mr. Neilson had told him in his specification, that it would succeed, and takes out his patent. There is no pretence for saying that Mr. Crane is an inventor, or that this is a new manufacture. Here is a known material, used in a known manner, for a known purpose, the manufacture of iron. All the world knew that the hot-blast could be used for the manufacture of iron; that anthracite could be used for the same purpose, though not so advantageously by itself. There cannot, then, be a patent for using a thing, for the same purpose, in a way which every one knows. All that the plaintiff has done was in the mere ordinary course of using Neilson's hot-blast; he has only followed up that which Mr. Neilson, by his specification, had told him was useful, and he has done nothing else whatever.

Next, the nature of the invention is not sufficiently described in the specification; for anthracite cannot be used with any real advantage in the ordinary large furnaces, and therefore to make that specification

good, it should give some explanation with respect to the sort of furnace required. It is not denied that anthracite may be used both in large and small furnaces; but as it can be used more advantageously in small than in large furnaces, the plaintiff ought to have pointed that out in his specification. The plaintiff's patent is also void as an infringement upon Neilson's, by reason of the express proviso in the patent, that it shall not interfere with any previous patent. The plaintiff's patent is an interfering with the patent of Neilson, which was for the use of hot air generally, in all furnaces whatsoever.

The Attorney-General, Mr. Vaughan Richards, Mr. Montague Smith, and Mr. Webster, for the plaintiff.—With respect to the question of infringement, it is uncertain, on the evidence, whether the defendants were not using all anthracite; but supposing it not to have been so, the use of $\frac{6}{11}$ths of that fuel in the manufacture of iron, in combination with the hot-blast, is a piracy of the plaintiff's invention. Would the defendants have used anthracite at all, had they not been taught to do so by the plaintiff's specification; did any person so use it? Was it known as a fuel to be beneficially employed in the manufacture of iron? The evidence shows that the best iron is made by the use of all anthracite; the defendants are contented with part of the advantage, in hopes of evading the plaintiff's patent right. The plaintiff has discovered a new fuel for a particular purpose; the use of any substantial quantity of that fuel is an infringement of his right. The plaintiff's claim is generally to the use of anthracite beneficially for the purpose of smelting iron, and the specification describes the manner in which it is to be so used. As to the novelty of this invention, the specifications of former patents go a long way to prove the plaintiff's case. It was a great desideratum to be able to use this anthracite; numerous attempts were made, patents were taken out for supposed methods of using it, but they all failed. The use of anthracite at Abercrave was a signal failure; iron was made by the use of anthracite, but it was at a loss of from 2*l.* to 4*l.* per ton; and the iron made was so bad, tender, and short, that it was got rid of with the greatest difficulty, the attempt soon abandoned, and the furnace given up. There is no single instance, before the plaintiff's patent, of anthracite ever having been used beneficially. If so, how came its use to be abandoned, or the discovery of the method of using it so great a desideratum. The material existed in abundance, but nothing was done with it; the instant that Crane's patent becomes known, the value of the whole anthracite district is increased beyond all estimate.

'As to the result of the process,—The quantity of fuel used is less, the yield of the furnace is greater. The iron produced is superior in quality. It is a new species of iron, such as has never before been produced in this country, or in any other, from coal, more nearly resembling the iron from vegetable charcoal than any other. Its superiority to ordinary iron is proved by the evidence of several witnesses, both as respects the uses to which it is applicable, as chain-cables, and the comparative strength of this and ordinary iron. Thus a better and a cheaper iron, and in fact a new article of commerce, has been produced. But it is said that there is not a sufficient amount of invention. How otherwise is the amount of invention to be measured than by the magnitude of the result? The test is not so much the amount of merit in the inventor as the amount of benefit from the invention. What merit is there in the mere receiver of a communication from abroad? And yet he is entitled to a patent. Some most important inventions have been the result of mere accident. The omission of the maundril, in Russell's patent, was the device of an idle workman to save himself trouble. The method of making water tabbies was discovered by the accident of a man's spitting on the floor. But, in fact, it did require thought and consideration to judge what the result of the application of the hot-blast to anthracite would be. It was necessary to consider what the effect of the hot-blast would be on the anthracite; what sort of iron would be the result. The proper degree of heat was to be considered; the proper proportion of coal and ore; the proper size of the pieces of anthracite; all of which are described in the specification. It is important to remark that the iron made with hot-blast and common coal is inferior to that made with cold-blast, while that made with hot-blast and anthracite is superior. Does Mr. Crane prevent any one from doing what he did before? There is, then, novelty in his invention. The objection is, that this is not a *new manufacture* within the statute. The cases which interpret those words show, that any material modification of the manner of making a merchantable commodity, producing an improvement in it, is a new manufacture, even if all the substances used were known and used before, provided they were not *so* used. In Daniel's patent, the method of shearing cloth from end to end with a rotary cutter was known; the method of shearing it from list to list with shears was known; a patent for shearing from list to list, with the same rotary cutter, previously used for shearing from end to end, was sustained. In the case of Hall's patent, the use of gas to pro-

duce a flame was known; the flame of oil had been used to singe off the fibres from lace, yet a patent for the application of the flame of gas to that purpose was sustained. In Derosne's patent, which was for the application of charcoal as a filter for sugar, there was nothing new in the method of using the charcoal as a filter, or in the sugar produced; but, though this was litigated on other grounds, the question of its not being a proper subject of a patent was never raised.

The real questions in respect of Neilson's patent are, Is the plaintiff's hot-blast the same as Neilson's? The fact of his having taken out a license is not conclusive; for he might take a license and not use it. Did Neilson contemplate the use of anthracite as fuel? Could his apparatus produce the temperature of 600° Fahr.? Could Neilson, following his own specification, have smelted iron with anthracite? It was said in the case of Crossley's patent that the terms of a patent must be taken with reference to the state of knowledge at the time. Neither Neilson, nor any one for eight years after his patent, appears to have contemplated the use of anthracite as a fuel for smelting iron in furnaces. The proviso in the patent simply means that, if a patent be granted for an improvement on a subsisting patent, the second patentee must either wait for the expiration of the first patent, or get a license under it. No real objection can be made to the sufficiency of the specification. It is said that the kind of furnace best calculated for the purpose is not described. The ordinary furnace, which can be, and is used for the purpose, is referred to. It would have been impossible at once to describe the kind of furnace; it would have required the experience of a life to arrive at the knowledge of it; but the plaintiff has described it according to the best of his knowledge at the time; and the Invention can be and is worked according to the specification. There is, then, no valid objection, either in law or fact, to the plaintiff's right; no one is prejudiced; Neilson is greatly benefited by the extension of his principle; the public and the nation at large are benefited by the introduction of these new articles of commerce, or by obtaining iron of better quality, and at less cost; the plaintiff has been at all the costs and charges of the introduction of this new manufacture into the realm, and is entitled to reap the benefit which will accrue from the judgment of the Court in his favour.

The Court took time to consider their judgment.

MR. WILLIAMS AND MR. ARMSTRONG.

Sir,—In my letter inserted in the last Magazine, on Mr. Armstrong's New Theory of Diffusion, I perceive there is an error in the column, page 88, where it is stated that Mr. Armstrong "wrote to my agent, stating, among other things, as follows," &c. This, I am informed, was not the fact—Mr. Armstrong having consented to the paper written by the solicitor, and a day and hour having been named, (more than once, I believe,) for the signing, after much alteration, and amendment; but which, for reasons which will appear hereafter, he avoided.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, Jan. 31, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM THOMAS BERGER, OF UPPER HOMERTON, GENTLEMAN, *for improvements in the Manufacture of starch.* Enrolment Office, Dec. 23, 1841.

These improvements relate to a new method of manufacturing starch from rice,—in the first place, by the application of an alkali,—secondly, by the means of fermentation,—and, thirdly, by a combination of both the foregoing: and also to a new mode of bluing starch.

In the first process for making starch, 112 lbs. of rice are soaked for two days in water, which is then drawn off, and the rice reduced to a cream, or pulp. A solution of 7 lbs. of carbonate of soda in 3½ gallons of water, is then added to the rice pulp, and the mixture stirred every four hours for fifty or sixty hours. After standing twelve or eighteen hours longer, the top liquor which contains the gluten is drawn off, and a second dose of carbonate of soda administered, and the stirring and standing repeated, after which the gluten is removed and the starch finished off in the usual manner.

In the second process, any given quantity of rice is placed in a suitable vessel and covered to the height of 6 or 9 inches with water for fourteen days; the water is then drawn off and the rice spread 6 or 9 inches deep on a clean wooden floor or racks, and frequently turned to prevent heating: when soft, the rice is levigated and finished off in the usual manner. In lieu of the foregoing, which the patentee terms the malting process, he states that he sometimes obtains the requisite fermentation and decomposition of the gluten by soaking the rice in water for five or six weeks. If the colour of the starch thus produced is not good enough, it is heightened by means of a chloride of lime or of soda.

The third process consists of a combination of the foregoing, by treating the fermented pulpy rice with an alkaline salt.

The process of bluing starch, is effected

by the use of artificial ultramarine, taking care, that if any free acid remains in the starch, to neutrulize it by an alkali.

The claim is—1. To the above mode of manufacturing starch from rice, by the application of an alkaline salt, whereby the gluten and starch of rice may be separated, as above described.

2. To the mode of manufacturing starch from rice, by submitting grains of rice to soaking in water and fermenting processes.

3. To the mode of manufacturing starch from rice, by the combined application of an alkaline salt, and a process of fermentation.

4. To the mode of colouring starch by the application of artificial ultramarine.

William Knight, of Durham-street, Strand, Gentleman, *for the invention of an Indicator for registering the number of passengers using an omnibus or other vehicles.* Enrolment Office, Dec. 28, 1841.

This invention consists of a counting or registering apparatus, contained in a box or case affixed to the side of the vehicle, which apparatus is acted upon by the axle of a revolving shaft, placed across the upper part of the door way or entrance to the vehicle. Through this shaft are placed two pairs of arms or levers, sliding at right angles to each other, one pair lying horizontally under the roof, while the second pair hang down against the door, and are moved by each passenger that enters the vehicle: thereby causing the ratchet wheel to be moved one tooth, which numbers one on the units cylinder.

The claim is to the combination of a counting apparatus, with an apparatus for causing the said counting apparatus to register the number of passengers travelling in an omnibus or other vehicle; such last mentioned apparatus being a revolving shaft, placed across the upper part or roof of the vehicle near the door way; such shaft having two pairs of arms or levers sliding through at right angles to each other, and when at rest, one of the pairs of arms lying horizontally under the roof, while the other pair hangs down against the door way, to form an obstruction which must be moved out of the way by the passenger on entering and leaving the vehicle.

John Venables, of Burslem, Staffordshire, Earthenware Manufacturer, and John Tunnicliff, of the same place, Bricklayer, *for a new and improved method of building and constructing vens Oused by potters and china manufacturers in the firing of their wares.* Enrolment Office, January 18, 1842.

The patentees state, that the furnaces ordinarily employed by potters consume an extravagant quantity of fuel, relatively to the quantity of ware which they contain; and the object of the present improvement is, to subject an increased quantity of goods to the action of the fire at one and the same time, and thereby economise the fuel. For this purpose, a cylindrical oven is formed, with a dome-shaped top, with a series of fire-places disposed around it, of a size and number proportioned to the magnitude of the oven. The heat is led into the interior of the oven by suitable flues, and a ledge or shelf is carried round the inner wall, upon which a circular stack or tier of *saggars*, (earthen frames for containing the wares to be fired, called by the workmen *bungs*,) while other tiers of the same are disposed about the floor in the ordinary way. In another form of oven, the ledges are not employed, but the flues are so disposed as to admit the heat between the several circles of the saggars. The ovens thus constructed are equally applicable either to the biscuit-baking, or to the gloss, or glazing process.

The claim is to the construction of ovens with one or more ledge or ledges, as shown, and also of ovens without a ledge or shelf, but with flues or vents either raised above the floor of the oven, or not at all raised, but with simple openings in the floor; whereby the patentees are enabled, in each of such several modes, to place one or more circles of saggars behind the flues or vents, and thereby to enlarge the capacity of the oven for the process of firing, without the expenditure of any extra quantity of coal or other fuel.

NOTES AND NOTICES.

Patent Iron Mason.—A machine under this name, (for which a patent has just been taken out,) is about to be erected in one of Mr. Nelson's quarries, at Woodside, Glasgow. The stones go into the machine rough as they come from the quarrymen's pick, and come out polished ashlar on the surface, and cut parallel and square on the sides, fully prepared for the builder, and this at an expense of not more than a fourth of work done by hand. The present machine is calculated to do the work of 250 men, reckoning only six hours' work out of every ten. The machine has been constructed by Messrs. P. W. M'Onie and Co., engineers, Scotland-street, Tradeston, the design and arrangements being the work of Mr. P. M'Onie, of that firm. We understand the machine, with the experimenting and patents, has cost 1,000*l.*, although new machines of the same size can now be made for one-third of that sum, and smaller ones proportionably cheaper. —*Glasgow Practical Mechanic.*

The Hannibal.—The keel of a 90-gun ship, to be thus named, has been laid on the stocks from which the *Trafalgar* was launched, in Woolwich Dockyard, and a number of workmen are actively engaged in preparing the materials necessary for her construction. The Hannibal will be a splendid vessel, on Sir William Symond's plan, and have a great breadth of beam, for which all the vessels designed by the present Surveyor of the navy are distinguished. The dimensions of the Hannibal are to be as follows:—

	ft.	in.
Length on gun-deck	204	0
Breadth, extreme	60	0
——— for tonnage	39	2
——— moulded	38	4
Depth in hold	23	8

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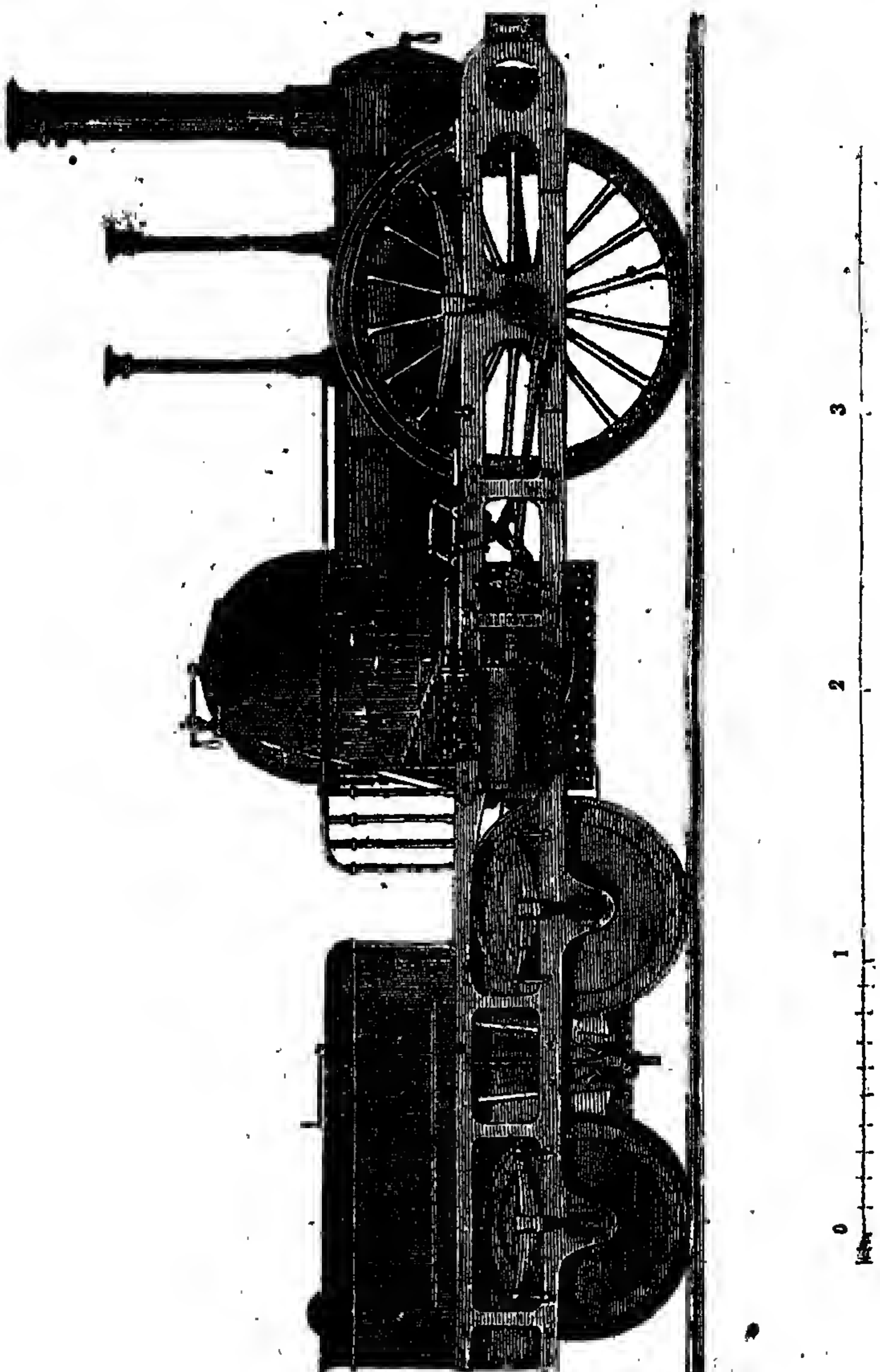

BELGIAN LOCOMOTIVE ENGINE.

BELGIAN LOCOMOTIVE ENGINE.

[Translated from the *Bulletin du Musée de l'Industrie** of Brussels, for the *Mechanics' Magazine.*]

When one advance has been made in any department of art, others are sure to follow fast; the human mind is ever on the alert, to improve and perfect its acquisitions. M. Arago shrewdly predicted, some years ago, that it would be long before we should hear the last of railways. He was not mistaken in this, though certainly he did very wrong to make use of that as an argument for postponing the extension of the railway system in France; to act so, was to convert progress itself into an obstacle to progress.

Several journals have already noticed the new locomotive of M. Deridder, called, from its economical properties, "The Economy;" and, if we mistake not, this invention is destined to mark a new era in the history of railways.

Already many experiments have been made with this locomotive, on the railway from Brussels to Túbise. On the 13th of July, 1841, it drew, on inclines of 1 in 250, 1 in 333, and 1 in 500, between these two localities, six wagons, carrying 7 tons 8 cwt. of goods and 15 passengers, making altogether a load of about 9 tons 9 cwt. The journey of 48 miles 12 furlongs, (going and returning,) was performed in 80 minutes, and the consumption of coke was only 2 cwt. 1 qr., or 32 lbs. per league of 3 miles 34 poles.

This machine bears to ordinary locomotives about the same proportion as the horse to the elephant; and, like the light but powerful courser, it is guided and controlled at pleasure.

Each driving-wheel has but the weight of one ton to support, instead of three, as in the case of the ordinary locomotive. The engineer has three different degrees of power instantaneously at command, to be used according to the inclination of the rails and the load; he may work either with half steam on, or full steam, or at any intermediate degree of pressure. The same carriage frame includes both engine and tender, which obviates the necessity of having flexible tubes to convey the water to the boiler. The cylinder, and all the rest of the machinery, are under the eye and hand of the engine-driver. The whole of the details, in short, of this machine bear the stamp of difficulty overcome, for almost every separate piece exhibits some improvement. The danger attending an undue elevation of the passenger carriages has been avoided, by placing the seats on a level with the wheels; the wheels themselves are so constructed, as not to be liable either to shrink or break from changes of temperature; and a much improved system of springing has been adopted in the buffers.

M. Deridder's engine, (from its combination of great power with extreme lightness,) renders it now practicable to have railways of almost any gradients. Railway making will, in fact, become reduced to a matter of mere surface levelling, which will allow of a vast saving in the purchase of land, in embankments, masonry, the length and thickness of sleepers, &c. The rails, too, may be reduced in weight, from 50 lbs. per yard to 25 lbs.; and, by an improved mode of construction, chairs may be entirely dispensed with.

We have only to add, that the justly celebrated English engineer, Mr. Robert Stephenson, who was present with several Belgian engineers at the trial before mentioned of the 13th of July last, fully recognizing all the advantages of this new system, addressed a few days after a letter to M. Deridder in the following terms:—

"Sir,—Since I had the pleasure of being present at the experiment with your locomotive and its train of carriages, I have maturely considered the reasons on which your new railway system is founded, and of the effect which it would have in diminishing the capital necessary for railway undertakings, and thus placing them within the reach of districts of comparatively limited traffic.

"I participate entirely in your ideas as to the principal details of this new mode of execution; it is not to be doubted, that from the moment its advantages begin to be fully appreciated, public opinion will force on its universal adoption.

"This system seems destined to unite with the great lines of communication, numerous seats of business of secondary importance, which, though commercial and populous, could not make an adequate return on such

* A new quarterly journal, of excellent promise, to which we wish every possible success.—Ed. M. M.

large capitals as are indispensably required for the formation of railways on the present system.

"Many railways which have been undertaken on a larger scale than there was commercial traffic to justify, would, nevertheless, have paid well, had your system, to which I am decidedly favourable, been adopted.

"It only remains for me to add, that the examination of your locomotive and your wagons has given me much satisfaction; the disposition of the mechanism is distinguished by more than ordinary ingenuity; and I have no doubt, that the application which you have made of the plan of working steam expansively, will be attended with a saving of about 40 per cent. in the consumption of fuel.

I am, &c.

ROBERT STEPHENSON.

[The preceding article is accompanied by an engraved elevation of the "Economy," which we have copied on a reduced scale on our front page, but no other explanatory engravings or details are given, so that after all that has been said —by our worthy brother Editor of the *Bulletin*, and our esteemed countryman Mr. Robert Stephenson,—the reader is still left to guess, if he can, and to wonder at all events, what the new improvements are, by which M. Deridder has so far outstripped (as alleged) all preceding locomotive builders. It is of great lightness certainly, this Belgian engine; but light engines, capable only of drawing correspondingly light weights (as seems to be the case with the "Economy") are no strangers to English railway practice. We have no desire to disparage M. Deridder's achievements, but must wait for further information, before we can subscribe to all that is here said in their favour. ED. M. M.]

FIRE PREVENTION—WOOD RENDERED FIRE PROOF.

Sir,—Having read in your 963rd Number, the observations and arguments of Mr. Baddeley and Colonel Macerone on the subjects of fire extinguishing and fire prevention, I must beg of you to insert in your journal my approval of the utility of being constantly provided with means ready to be put into immediate use; and I must particularly assent to the valuable maxim of the Colonel, "that prevention is better than cure;" yet considering that I am in possession of the knowledge requisite to protect wood from fire, and to thwart in a great measure the destructive progress of the "devouring element" at one hundreth part the expense attendant on the Colonel's plan, I must entirely dissent from the adoption of that plan. I know a cotton factory, whose eight floors, containing each 600 square feet of wooden surface, have been as effectually fire-proofed, at an expense of 2*s.* 6*d.* each floor, as though they were metal, and have several times resisted the action of fire, as completely as though they were wetted with water. Now, Sir, the capability to do this surely deserves attention, and the object of this letter is to bring the same under the notice of some capitalist, who may be willing to secure an interest by patent in so valuable a discovery. In the above instance of protection 4,800 square feet of deal were made to resist fire at an expense of 20*s.*, and so complete is the effect of this remedy, that wood so treated *will not burn with flame,* nor will its carbon *ignite* like other carbon; and if air be blown upon wood so prepared, and thrust into a fire at bright red heat, it is *kept cool* and *prevented from burning.* Nobody will, I think, attempt to deny, that the principal sources of fuel in "fires" generally are the floors, and therefore, if these are once protected from kindling, all chance of a destructive fire will be avoided.

The process is so simple and so easy of application, that it can be applied to wooden fittings after erection in one day, provided they are free from paint, and if we may reason from analogy, wood so prepared, can never undergo the action of dry rot. After simply inviting such of your readers as are able and willing to spend a little money in a project which must certainly be lucrative, and stating that I shall be happy to convince any honourable individual so disposed of the tangibility of this process, I shall conclude, with soliciting your instrumentality in aid of this object.

I am, Sir,

Your obedient servant,

W. R.

Southwark, January 31, 1842.

[Another correspondent (W. M. S.) who writes from Staffordshire, professes also to have discovered *a very harmless and cheap ingredient* for rendering timber, linen, cotton, paper, &c. fire-proof. A specimen of linen thus treated has

been forwarded to us, which is quite incapable of burning with a flame. The process is represented as consisting simply of immersion in a liquid and hanging out to dry; the act of mangling or ironing afterwards does not lessen the effect.

Any communication for W. R., is requested to be addressed to the care of the Editor of the *Mechanics' Magazine.*]

PREVENTION OF FIRE—COLONEL MACERONE IN REPLY TO MR. BADDELEY:

"Think'st thou, because *thou* 'rt honest, we shall have no more cakes and ale?"

Sir,—In No. 964, there is a letter from Mr. Baddeley, animadverting upon my previous week's communication to you, on the prevention of fires. I should not have troubled you with this little notice, were it not for the very high esteem in which I hold the talent, benevolence, and diligence of Mr. Baddeley, with whom I should regret to have any difference of opinion, on matters of fact and public utility. Mr. Baddeley says, that he is "sorry" that the shortness of my memory should have betrayed me so much into error on the subject of fire *prevention.* I do not impugn the correctness of Mr. B.'s statement, as to his having suggested in your pages the iron staircases, "antiphlogistic" plaster, &c. But this I can state, that I have never seen any thing of his, save on the proper use of fire-engines, the supply of water, &c., and excepting his eulogium of the bubble patent cement, the first experiment on which I *saw* exhibited on a doorless, windowless, curtainless, little house in South Lambeth, before a number of scientific gentlemen and directors, in the summer of about (I think) four years ago. I was there the day before the "triumphant" experiment; I saw the cement laid on the ground floor doorways. I took a portion of it home with me, and found it to consist of Roman cement, size, and alum. I saw the tubs of Roman cement, those of size, and others, which, not being open, I cannot swear contained the alum. True, in my last letter I forgot to mention the alum. But on the subject of anti-combustion appliances to timber, thatch, and linen, my memory has not "betrayed me so far" as to make me forget that I applied a solution of alum to dimity curtains, and to the canvas of theatrical scenes, at Naples, so far back as 1811. Moreover, I wrote on that subject, and on Hartley's plan, and on iron staircases, to the *Times* and *Chronicle*, full twenty years ago. Five years ago, I wrote on the same matters to our *Mechanics' Magazine*, with the addition of instructions to render quite incombustible the thatch of cottages, barns, in fine, all thatch, by saturating the whole straw with common whitewash, with a pound of alum to a pailful.

Neither in my article to which Mr. Baddeley objects, nor in any other, have I denied a fact of which I knew, or know, nothing, *i. e.* Mr. Baddeley's having written to you about any other *preventive* from fire, save and except his warm eulogium on the "Patent Fireproof Cement." I will not forget to mention, that I have also proposed to soak deal boards in a strong solution of alum, and also to paint them with a paint composed of linseed oil, colour, soap, and alum. The *surveillance* which I recommend to prevent architects and builders from placing their fire flues in juxtaposition with the deal boards and other timbers of houses would not, in my opinion, be, as Mr. Baddeley calls it, "an outrageous infraction of the liberty of the subject." There are innumerable laws existing, which, for the (at least pretended) benefit of the community, sorely infringe upon the lieges' liberties. Take for example the whole body of the Excise Laws—the laws against free trading (in many commodities) free sporting, free speaking, &c. But the list of such laws would cover far more paper than I have at my disposal. At any rate, the insurance offices ought to resist the payment of all sums claimed for damage done through such reckless and stupid arrangements of fire-flues and deal boards, as have lately destroyed the Houses of Parliament, the Royal Exchange, the roof of the Reform Clubhouse, and several stately mansions.

Yours obediently,

MACERONE.

P.S.—I will send you an account of the experiment at the South Lambeth house, *which I witnessed.**

* [This experiment was described at the time, by Mr. Baddeley, in our 778th No. ED. M. M.]

PRACTICE AND PRACTICIANS, *v.* MATHEMATICS AND MATHEMATICIANS—S. Y. IN EXPLANATION.

[We stated last week, in our Notices to Correspondents, that we declined inserting this letter, because, in our judgment, it exceeded the limits of free discussion. The writer has since given us permission to leave out the parts we considered particularly exceptionable, and it is now published with these parts omitted. What remains will, we have no doubt, be quite sufficient to vindicate the writer from all suspicion of having intentionally misrepresented Mr. Cheverton.—Ed. M. M.]

Sir,—I should have thought Mr. Cheverton might have managed this discussion without parading his own notions of honesty, or attacking mine; but as he has not chosen to do so, I must explain that, when he quoted somebody's censure in No. 959, I was led to suppose it *might* be his own, by his remark, that the writer "appeared to know me well;" which remark struck me as being discreditable to Mr. C. For, as he and I are total strangers to each other, I did not see how it was possible for him to have had any opportunity of forming such an acquaintance with my characteristics, as could justify his saying whether I was, or was not, apparently well known to a third person; and I consider a strictly honest man would not give an opinion upon any subject upon which he had never possessed the necessary means of forming one. But I suppose Mr. C. takes a different view of the matter; otherwise, he would probably have adopted a lower and more discreet tone respecting "blunted perceptions," and all the other offensive personalities, without the aid of which, it would seem, he knows not how to conduct his defence.

Mr. Cheverton's paper in No. 956 appeared to me an attack upon the mathematics, and when I read it, I thought reasoning would be wasted upon such a production, and that to make its weakness manifest, nothing more was necessary than to place the contradictory assertions conspicuously; or to change the terms in which the statements were made, so as to state an extreme case, of precisely the same nature as that described in each of Mr. C.'s charges against that science; and I suppose, by his being so very angry, he feels that in No. 958 I have succeeded in exposing the errors of his paper.

* * * *

But Mr. C. denies that he *intended* to attack the science; and seems unable to conceive that there may be a vast difference between what he intended and wha he performed. Let us examine.

* * * *

In No. 956, Mr. Cheverton, speaking of Mr. Pilbrow, says, "not perhaps that he himself is a mathematician, but an instance, not at all uncommon, of the *baneful effect* which a blind indiscriminating admiration of the science, *or even an imbibing of the spirit of the science, has generally upon our modes of thinking and reasoning.*" And in the note appended, it is said, "As a curious instance of *the influence which this science indirectly exerts*, not indeed in producing baneful effects—*for that is too sober a word*—but in *leading a writer into a display of ludicrous pedantry and solemn foolery*," &c. &c. May not any science which does *even* this—and I could quote many other charges of a similar description—be fairly called a *noxious science?* The spirit of *the science* is distinctly charged, in the first of the above passages, with having a "baneful effect" upon our *modes of thinking and reasoning;* and the passage from the Commissioner's report is cited to prove the *worse than baneful influence* which "*this science indirectly. exerts*," and NOT "as an instance of the ludicrous, rather than the baneful effects of imbibing the spirit of the science," &c., as Mr. C. *mis*-represents in No. 963. Again, the *baneful effects* are clearly described, in No. 956, as arising from "*this science*," and from an "*imbibing of the spirit of the science*," and NOT as "flowing from a blind indiscriminating admiration of it," as is erroneously asserted in No. 963. I have here pointed out the true meaning of the passages quoted, which no reference to the context, *as it exists in No.* 956, can alter; and if any one doubts that I have done so, I beg he will be good enough to refer to page 442, and judge for himself. If Mr. C. had merely pointed out the ill effects of a blind, incautious, and improper application of the pure science to practical purposes, no one would have been more ready to commend him than I should; but I consider he did not do so.

* * * *

I am, Sir,

Your obedient servant,

S. Y., (an Engineer.)

January 24, 1842.

ON THE CAUSES OF INJURY TO STEAM BOILERS.—BY C. W. WILLIAMS, ESQ.

Sir,—In my last paper on this subject, I explained some of the causes of those injuries to which steam-boilers are exposed, and dwelt on the circumstance, that the sediment assumes two distinct forms, namely, that of a solid crystallized incrustation, and of a loose mud-like body, held merely in suspension. I showed that the first could not be the cause of injury to the iron plates of boilers, inasmuch as it was itself a good conductor of heat; whereas the second—the floating matter—would become a positive non-conductor, if allowed to subside, when the boiler had been at rest for some hours, and when it would assume the dry hard consistence of plaster of Paris.

I now propose to give further proofs of the conductibility of this solid crystallized incrustation, and draw some important inferences therefrom. I had two pins constructed, to act as conductors, each three inches long and three-quarters of an inch square, one made of iron, and the other cut from a large slab of incrustation taken from the interior of a marine boiler. These were inserted into separate vessels, containing water, the one end projecting half an inch into the water, through the side, and the remaining part projecting outwards, to receive the heat from a powerful gas-burner. These vessels were so protected, that no heat could reach them, except what passed longitudinally, and exclusively through the conductor pins; consequently, the water received no heat except what was conveyed, by conduction, through those pins.

By means of the *iron* conductor pin, the water was made to boil in 13 minutes, and by the *incrustation* conductor pin, in 17½ minutes. That the pins themselves were not raised to any inconveniently high temperature was proved by the fact, that when suddenly removed from the flame, which was very intense, and while the water was fiercely boiling, the pins themselves were at a temperature so low as to allow the finger to be pressed against them without inconvenience; it certainly did not appear to be above 500 or 600 degrees—a temperature far too low to produce any injurious effect on their structure. This experiment resembled the well known one of taking a kettle containing boiling water from the fire, and placing it on the hand, for an instant, and without injury. I may here observe, that I was not able to discover any difference between the temperature of the two conductor pins.

Now, since no heat was received by the water, in either case, except what passed longitudinally through the conductor pins, it is manifest that the entire heat which raised the water to the boiling point, and maintained it in a state of active ebullition, must have passed through a vertical section of the side of the vessel, of but three-quarters of an inch square. This experiment therefore proved, first, that this three-quarter-inch surface of the boiler plate was sufficient for the transmission of a quantity of heat out of all proportion greater than could have been transmitted by such area under ordinary circumstances; second, that this incrustation, (which was crystallized sulphate of lime,) possessed an admirable conducting property; and, third, that no possible injury could be sustained by the conductor itself, so long as its temperature remained so low.

The first of these facts shows how erroneous have been our previous modes of estimating the evaporative power of any kind of boiler, or fuel, by calculations drawn from the mere areas of the exposed plates; while it proves that much may yet be done in this department of the boiler. The second shows that, in this crystallized state of the deposit, it cannot be the cause of injury to the plates, although the uncrystallized or loose matter, if allowed to settle and become hard, becomes a mischievous non-conductor, and the direct source of injury from overheating and bulging. The third proves, that if the recipient body to which the heat is conveyed be able to absorb the heat as fast as it is passed through the conducting body, no injury can be sustained by the latter, seeing that this solid mass of incrustation, (hitherto supposed to be a bad conductor,) itself remaining unaffected, was equal to the conveyance of a very powerful heat, through no less than three inches; while, in fact, it never reaches to above half an inch in thickness on those parts of boiler plates which are exposed to the greatest heat.

Now, to apply these facts, and the in-

ferences to which they lead, to practice. We find that, so long as the water is maintained in contact with the plates through which heat is conveyed by conduction, no injury will be sustained. But the question arises—what is there to interrupt this contact, and what other recipients than water, are to be met with in boilers? In land engine boilers, no injury can arise to the plates from any circumstance connected with the furnace or fuel, beyond the ordinary wear and tear, (the sources of which will be hereafter examined,) if due attention be paid to cleanliness in the interior, and maintaining the water at its proper level. Marine boilers, however, from their peculiarity of construction, are subject to another source of injury, and which is too often destructive of the plates connected with their furnaces and the parts adjacent. This peculiarity consists of numerous vertical narrow passages. In these, the steam, as fast as it is generated, becomes, by reason of its ascending current, so mixed with the water, as seriously to obstruct the free and continued access of the latter to the plates. This also takes place to the greatest extent in those parts which are exposed to the highest temperature, since such ascending current of steam is necessarily the greatest where the heat is greatest, namely, in the side plates of the furnaces. The consequence is, that these side plates, through which the heat is conveyed to the interior of such narrow passages, are more frequently overheated and bulged than other parts, though exposed to even a still higher temperature from the direct action of the flame.

The heating of the side plates of the furnaces of marine boilers, may therefore be said to arise solely from the circumstance, that by reason of the conflicting currents of steam and water, in those narrow passages, or water-ways, the recipient, being then a mixture of water and steam, (too often of the latter alone,) the heat cannot be taken up as rapidly as the metal conveys it, and the usual consequences of over heating necessarily follow.

This interposition of steam, where water alone should be found, and its inevitably injurious consequences, were strikingly illustrated in the first boilers of the transatlantic steam ship, the *Liverpool*. In these boilers, the water spaces were above 5 feet perpendicular, and but 5 inches wide, thus leaving a space of but 2½ inches for the water approaching the side plates of each of the furnaces, and the steam generated by the heat received through such plates. This steam was necessarily so great in quantity, as to prevent the access of the water, and in fact became itself the recipient of the heat from the furnaces; the consequence was, that the plates became overheated, bulged, and cracked, and extensive injury was sustained by them during every voyage. Not unfrequently they required to be wholly removed and replaced at a considerable expense before a new voyage could be commenced.

That steam, in fact, was the recipient of the heat in those narrow passages, where water should always predominate, was proved by a very simple and conclusive experiment of the engineer, during one of his voyages. He introduced a trial pipe in the space, (erroneously, in this instance, called the *water*-space,) between two of the furnaces, and on a level with the fuel—the inner end opening into such space, and the outer end projecting outside the boiler, and being furnished with a stop-cock. The result proved his anticipation; for on trying this pipe, when the furnace was active, he could never draw off any thing but *steam*. This circumstance was conclusive, that although the water continued at its proper level in the boiler, yet, by reason of the confined nature of the passages, and the absence of a free circulation and access of the water, (at the very place, which of all others, required its continual presence,) the steam, a bad recipient, had usurped its place. This source of injury continuing, the furnace side plates, as constantly, were deranged, while the roofs and other parts remained sound to the last.

From the instance here adduced, it does not follow that any given width of water-space is necessary, or that narrow spaces must always be injurious. I have frequently observed that spaces of but 3 inches wide between the furnaces have been unattended with injury to the plates. The cause of injury then, arising from the predominance of steam instead of water, is rather to be traced to other circumstances connected with the circulation of the water in the boiler, and the aids or impediments it receives from the

peculiar construction or arrangement of the flues.

The main practical consideration, then, in seeking to protect the plates of boilers from overheating, is, that it is not to the fire, or furnace, that attention should be directed, but simply and solely to the nature of the recipient to which the heat is conveyed, for in this will be found to rest the whole question of injury. This will be objected to by those who have hitherto anticipated danger from hard firing and incrustation, and the want of due proportions between the fire and flue surface. Yet I state the position broadly, after the fullest investigation and the most conclusive proof, that if we look to the recipient and its heat-absorbing properties, and attend to the interior of the boiler, and preserve all right in these respects, we shall do all that is practicable towards preventing injury from overheating, or what is erroneously termed "burning the plates."

Let us now enquire what are the several recipients of heat which present themselves in ordinary boilers. These are:—

1. Water.
2. Steam.
3. Air.
4. Deposit crystallized.
5. Deposit uncrystallized.

The two latter have already been examined. I have now to speak of the three first mentioned, and this I will do in my next communication.

I am, Sir, yours, &c.

C. W. Williams.

Liverpool, February 7, 1842.

ON EVAPORATION BY CONDUCTION. BY C. W. WILLIAMS, ESQ.

Sir,—In reply to the observations of your correspondent, C. W., in your last week's Number, suggesting improvements on my mode of increasing the evaporative power of boilers, I fear he overlooks the main object contemplated by me, which is, not to increase the interior heat-distributing surface of a boiler plate, but to enlarge its exterior heat-absorbing surface. In fact, I require no addition to the inner surface; not on account of the difficulty of removing deposited matter, but because the plane inner side of an iron plate is quite sufficient for the transmission and distribution of all the heat that could, by possibility, be received by the plane outer side of such plate. "Ribbed plates," as suggested by your correspondent, certainly have their value in many respects; as where a slower and more uniform absorption of heat by the liquid is advisable, as in some saline, gelatinous, or other bodies; but, with reference to my object, the mere evaporation of water, such I have found in a great degree to be injurious.

There are in boilers the two surfaces or sides of a plate to be attended to, namely, the inner, or heat-distributing surface in contact with the liquid; and the outer, or heat-absorbing surface exposed to the fire or flue. Now, I find that the former is adequate, not only to the distribution of as much heat as can be taken up by the latter, (both being plane,) but even to ten times as much. This is the origin of my plan of increasing the evaporative power of a boiler, and which consists in enlarging the outer receiving surface, so as to obtain a larger quantity of heat. With this view, I present to the action of the heated gases passing through the flues of boilers a large additional absorbing surface, and without adding any thing to the interior distributing surface. The use and value of the pins arises from the well-known property of metallic bodies to transmit heat by conduction. These pins I construct from two to four inches in length, beyond which there can be no practical advantage gained.

Being now engaged in a series of experiments, on the large scale, on this important subject, I will recur to it on a future occasion.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, February 9, 1842.

SINGULAR PHENOMENON—BURSTING OF GAS PIPES.

Sir,—The bursting of water pipes is a subject that has been very fully discussed in your pages, and one that was supposed to be tolerably well understood; but a circumstance has just occurred that appears to distance all our knowledge on this subject.

By protecting my water pipes with ashes, as stated at page 19 of your 961st Number, I have preserved them uninjured through the frost; but I have a syphon pipe, leading from my water cis-

tern into the garden, with which I took another course.

This syphon consists of a piece of half-inch drawn tin tubing, such as is used by gas fitters, 15 feet long and ⅜ths of an inch in diameter externally; the longer leg of the syphon is about 8 feet, the short leg about 4 feet in length: the former is led down a brick wall, to which it is lightly secured by wall-hooks; the latter dips into the cistern. At the latter end of October last, before the frost set in, having no further occasion for any water in my garden, I emptied the syphon, but afterwards shut the cock—which terminates its lower leg. One day, last week, I attempted to refill the syphon by exhausting the air from its longer leg, but failing in this, I began to look for the cause, when, to my great surprise, I found the empty pipe had actually burst about 9 inches above the cock; not a mere slit, but a palpable enlargement of the pipe, and a rupture exactly as shown in the accompanying sketch. The only pressure that I can conceive to have been operating

within the pipe, is that which would arise from a slight compression of the air within the syphon, as the water rose in the cistern around and within the shorter leg, a pressure that would seem to be altogether inadequate to account for the effect produced.

We have frequently heard of the bursting of gas-pipes, an idea which I have always scouted, seeing that the pressure within them never exceeds that of an inch of water, and yet this fact has been most confidently asserted as the cause of several destructive fires. It happens unfortunately in these cases, that as soon as the gas becomes ignited at the aperture thus made, the metal is almost instantly melted, and prevents any observation being made. The positive bursting of such pipes, however, *under slight pressure*, or in consequence of some disintegrating property of the metal of which they are composed, seems to be demonstrated by the fact which I am now describing. The explanation of this phenomenon is of infinite importance to our domestic safety, as proving the liability to accident from this hitherto unperceived cause, and it also becomea desirable to know whether *leaden pipes* are subject to the same law.

The alternate expansion and *partial contraction* of leaden pipes, is well understood; how far tin may be subject to a like influence, and whether this will go any way towards explaining the phenomenon in question, I leave your better informed readers to explain. Any persons interested in this question are welcome to inspect the ruptured pipe, which shall remain untouched for a week or so.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

29, Alfred-street, Islington, February 3, 1842.

SUGGESTIONS FOR THE IMPROVEMENT OF CANAL NAVIGATION.

Sir,—During the rapid progress of railways our canals have been less thought of, but there is no doubt but the present mode of canal conveyance may be much improved. The principal object to be gained is a quicker transit of goods or passengers, which can only be effected by the boats passing along the canals at greater speed and by being less detained at the locks. It is admitted that a boat at a quick speed meets with less resistance than one at a slow speed. We have had reports of several trials of boats being

propelled by steam, but we never had a trial of the following plan—a towing-path on each side of the canal with iron rails, and an engine similar to our present railroad, propelling a limited number of boats. Where it is actually indispensable for the canal to rise or fall, there might be some description of lock similar to "Salt's Perpendicular Lift," as described in your Magazine, vol. xxxiv., page 465, which would at once move a boat from one level to the other, and save the great loss of water consumed by our present locks. The engine must be either removed by an inclined plane and the assistance of a stationary engine, or passed over the canal by a swing bridge to the other towing-path where it would be required to convey boats in the contrary direction, and another engine might be in readiness on the other level to continue the line of boats formed. The stationary engines would prevent the locks being stopped by frost in winter. Where tunnels were actually required, there must either be a stationary engine or towing-paths through them. A canal with a single towing-path would be more economical. The above plan would offer a delightful trip—no concussions or unpleasant motion in travelling, and less work for coroners and jury-men.

GESTATOR.

Liverpool, Feburary 3, 1842.

E. A. M.'S NEW THEORY OF THE UNIVERSE —EXPLANATION OF TERMS.

Sir,—In reply to the remarks with which Mr. Pasley has favoured me, I can only say, that I shall always be ready to adopt any term that may be deemed preferable to my own, as soon as I am satisfied that it fully expresses my meaning. In accordance with my theory, the *medium of space* would consist of a simple medium with solid atoms differently disposed, as explained in your 908rd Number, and that it is only in communication with organic matter that a *different disposition of the atoms with the medium* occurs. In my first paper I stated that I used the term *firmamental fluid* to express the original light which was first created, and which required to be re-constructed by the sun to adapt it to the eye. Earth and heaven, in a material view, only mean body and light. As the word light has so many meanings, I chose (perhaps injudiciously) the term firmamental fluid, but with the express intention to make it understood, that the said fluid was to be found every where, except where interrupted by solid matter. In further illustration of the description of the medium, it may be as well to observe, that the presence of the solid atoms in the medium occasions a denser atmosphere round each atom, so that when they are pressed together they restore themselves to their original distances. The tendency to produce stillness and compactness in the cold medium, and the tendency to promote motion and diffusion in the hot medium, I have, perhaps, improperly designated freezing and heating principles. I am unused to discussion. By a chemical change, I mean a variation in the disposition of atoms, which occasions a variation of sensation.

"The friction attendant on life" must surely be an important agent in the conversion of the cold medium into the hot medium. Whether a man be passive as an Esquimaux, receiving his last gulp of blubber from the *fair fingers of his lady*, or alert as the conductor of a steam train; whether he be simple as a new-born babe, or "wise enough for fools to think him mad;" whether he earn his bread by the spade, or the "frictioning about" of the harlequin,—I have not the least doubt that every state tends to the benefit of the whole. As long as he *draws his breath*, the "friction attendant on life" will perform its office. What, if 800,000,000 of human beings, &c. were destroyed at the deluge; can any one look at a glass of water through the solar microscope, and imagine that this would occasion a scarcity of animal life? A little difference perhaps in the method of performing the same operation.

All theories appear easy to the mind that forms them. Mine assigns a purer element for organic nature than exists elsewhere, consequently, a becoming seat for life; while it at the same time converts a condensing power into a diffusive one, the whole being of course in a state of motion. Is this difficult? The machinery of the universe, materially, appears to have been completed on the fifth day; consequently, the existence of man was not necessary to the motions of the solids of the universe.

I have neither ambition nor conceit: I am fully aware of the disadvantages un-

der which a person resident in the country, without friends whose taste leads them to the same pursuits, attempts to bring forward a subject of so much importance; but as it appears to me to offer a foundation on which many very interesting explanations may rest, I am anxious to have it rightly comprehended, and shall always be happy to discuss any point which may appear to be doubtful, either with Mr. Pasley, or others of your correspondents.

I remain, Sir,

Your obedient and obliged,

E. A. M.

February 2, 1842.

HINDU PROCESSES OF QUARRYING AND POLISHING GRANITE.

[We extract the following interesting description of these processes by Lieut. Newbold, from Minutes, in the *Athenæum*, of the Transactions of the Asiatic Society.]

The most usual mode followed in India is to employ the agency of fire. In this process, the granite rock is covered with dry bushes of the various acacias common on the plains, which are then fired, and kept burning until quite consumed. The intense heat causes a separation or exfoliation of the granite, to the depth, perhaps, of 24 inches, in the centre of the fire, but gradually thinning off towards the edges. The piece thus exfoliated is then detached, by driving in small iron wedges at the extremities, and is finally raised by a powerful lever. Sometimes the rock proves more refractory than usual, and then it is customary to pour cold water upon it when hot, or to drop on the surface a heavy boulder of greenstone or granite. When blocks are required for statuary or mill stones, or for any other purpose where greater thickness than one or two feet is requisite, another process is followed, precisely similar to that employed by the ancient Egyptians in quarrying the granite of Syene. A great number of holes, an inch square, and of different depths, according to the size of the block wanted, are bored in the rock, close to each other, forming a connected chain around the piece to be detached. Each hole is then fitted with an iron wedge, and the whole are simultaneously and unremittingly struck with iron hammers, until their united force overcomes the adhesion of the block. The chisels used in piercing the holes are kept cool, by pouring water upon them while working, as is done in Europe. When long and thinner slabs are required for bridges, pavements, lintels, &c., a third process is employed, combining the principles of the two former. The rock is heated, as in the first mode, and the separation is completed by driving wedges into a chain of holes, as in the second. In this way Lieut. Newbold has seen blocks of 80 feet in length separated. He also observed that the Hindus take advantage of the calorific action of the sun's rays, in promoting the separation of the granite slabs; and that they, therefore, select the hot season for their work. He found the temperature of a rock at Dewanconda to be 120½°, while that of the surrounding air was only 100° in the sun, and 95½° in the shade. Sometimes they pour cold water into the clefts made by the wedges, which greatly hastens the separation of the block. The polish given to Indian granites is at least equal to what is found in Egypt; and good specimens may be seen in the Mausolea of Golconda, at Bejanugger, Galberga, and many other places in the peninsula. To effect this beautiful polish, two processes are followed. When a flat surface is required, the granite is slightly smoothed and flattened by an iron tool; and is then rubbed with a large and heavy block of granite, hollowed on its under surface, and having the hollow filled up by a mixture of lac and corrundum. The mixture adheres strongly to the stone, which is tightly fixed between two rods. The extremities of these rods form the handles for two workmen, who draw the stone backwards and forwards over the block to be polished, occasionally throwing water on the surface, to prevent the lac from melting. When the piece to be polished is of a more varied form, as a cornice or moulding, or figure, a piece of wood, with the corrundum mixture, or even a lump of the mixture alone, is used instead of the granite polisher. Any one who has seen the process will be strongly reminded of it by the paintings at Thebes, representing sculptors polishing a statue, which are copied by Rosellini, and in Wilkinson's "Ancient Egyptians." Lieut. Newbold mentioned a remarkable fact connected with the granite of India; that much of it was in the form of spheroids and bosses, having a concentric laminar structure, like the coats of an onion, which frequently exfoliated by the action of the air, throwing off curved laminæ of very varied magnitude. This exfoliation of mountain masses produces some of the most picturesque features of the Indian landscape. It is the cause of its singular dome-shaped mountains and mamillary masses, crowned with tors which would in England be considered Druidical. Rough sketches of some of these, from Bellary and Bavagudda, were shown to the meeting, strongly resembling the Cheese-ring and Logan-stone, so well

known in Cornwall. The paper concluded with some account of the uses to which granite is applied in India; and a brief notice of the colossal temples and figures, and of the pillars, obelisks, and bridges of this material existing throughout the peninsula.

APPLICATION OF THE ARCHIMEDEAN SCREW.

Sir,—In your last Number, 965, there is an error of the press, of much consequence to my statement. For 1837, read 1827, which was the year in which I presented my Screw, or "Archimedean" Ship Propeller, to the Lord High Admiral, which he thought proper to reject as quite inapplicable.

I am, Sir, your obedient servant,

F. MACERONE.

THE PECULIAR CASE OF OXYDATION.

Sir,—In Number 963 of your valuable Magazine, a "Constant Reader" wishes to obtain some information respecting a peculiar case of oxydation in a carpenter's stove; I beg leave, through your pages, to give him what knowledge I may have upon the subject: When he has covered the carpenter's stove with plank outside of the flanges, leaving sufficient space for sawdust, he finds the stove to be rusted $\frac{1}{18}$th of an inch. Now, I think that the sawdust must either be damp, when placed between the iron and the plank, or the steam might possibly get through the flanges, and damp the sawdust, which would then oxydise the iron.

The insertion of the above will oblige your obedient servant.

W.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JOHN STEWART, OF WOLVERHAMPTON, ESQ., *for certain improvements in the construction of piano-fortes.*—Enrolment Office, Jan. 7, 1842.

The first of these improvements, which are five in number, consists in forming the frame of metal divided into compartment for the reception of the sounding-boards, which are only connected with the frame at intervals.

The second improvement relates to the mode of constructing and applying sounding-boards. These sounding-boards, three in number, are denominated the *treble*, adapted to the smallest partition of the frame; the *tenor*, occupying the middle compartments, and a size larger than the former; and the *bass*, which is considerably the largest, and is fitted in the remaining partition of the frame.

The third improvement relates to an improved mode of applying the bridges; these are of beech, 4 feet long, and half-an-inch wide at the treble end, gradually widening to three-quarters of an inch at the bass extremity. The bridge is arched into twenty-one abutments, each of which rests upon the sounding-board. The pins for the lower frets are placed on the top of the bridge, (which is perfectly straight,) as usual.

The fourth improvement consists in a new mode of stringing, by hanging the wires in small slides fixed in the upper edge of the stud-bar, whence the wires are carried to the pins at the lower edge of the bar, forming the upper frets; the strings then pass down to the bridge in the ordinary way, forming angles between the respective pins placed therein, and after passing below the bridge they are hooked upon steel wires ten inches long, twisted double, with an eye at one end and a hook at the other. The eye is attached to one of the screws of the screw-bar after passing the tension-bar; the other end has a strong steel or iron wire hook, to which a string is attached; it is then turned in the usual manner.

The fifth improvement consists in applying the action to upright piano-fortes, by placing the action underneath the keys, and causing the hammers to strike the wires in two distinct lines. The first line of hammers begins at the highest treble wire, and proceeds gradually downwards beneath the stud-bar to the centre of the scale. The second, or bass line begins at the usual distance from the feet placed on the bridge, and is progressively carried up in an oblique direction to the last note of the bass. A descending wire, or other appropriate connection is adapted to the end of each key, its length being varied to suit the position in which each particular hammer is required to strike its string.

OWEN WILLIAMS, OF BASING-LANE, LONDON, ENGINEER, *for improvements in propelling vessels.* Enrolment Office, February 4, 1842.

The first of these improvements in propelling is carried out in the following manner:—Two cranks on each end of the engine shaft project beyond the sides of the vessel; to these cranks two rods are jointed, to the lower ends of which floats or paddle-boards of wood or iron are affixed.

Immediately under the crank-shaft are two axes or guides, through which the paddle-rods slide freely, the guides at the same time turning in a horizontal direction. These guides act as fulcra, and also regulate the

angle at which the floats enter and leave the water.

A second improvement is intended to take advantage of the pitching and rolling motion of the vessel, and thereby effect its propulsion; for this purpose, two flat horizontal floats, or buoyant surfaces, are placed one under each quarter, and attached to two upright rods or stems. These rods are connected by pin-joints and two parallel bars to the vessel's sides; the rods passing up into the vessel, are there attached to the end of pump levers, which raise and force water out of the stern, and thereby propel the vessel. The floats may either be immersed in the water, or float on its surface, and may he applied, in any convenient position, either to work pumps, or, by the intervention of suitable mechanism, give motion to any kind of propelling apparatus. How much oftener will this delusive scheme be patented?

Thomas Stopford Jones, of Tavistock-place, Russell-square, Gentleman, *for certain improvements in machinery for propelling vessels by steam or other power.* Enrolment Office, February 4, 1842.

These improvements consist in the employment of two series of cranks for causing the floats or paddles to describe an elliptical path, and to enter and emerge from the water at favourable angles.

For this purpose, a main crank-shaft, of any given throw, projects from the engine shaft, beyond the side of the vessel. Immediately over it, but at such a distance as to allow the two cranks to revolve clear of each other, is placed a second crank, having a smaller throw than the former. The neck of the main crank works in a suitable bearing on the upright stem of the paddle or float board, the head or upper part of which stem has a slide drop link groove, within which the brasses in which the upper and smaller crank work slides up and down, as the crank revolves, thereby compensating for the difference between the circles described by each. By this means the paddle or float board is made to describe an elliptical path, and also to enter and quit the water at a favourable angle.

When two or more paddles are employed, they are placed one behind the other, in the direction of the vessel, each paddle stem having a large and small crank, connected together so as to be driven by the main crank shaft of the engine; three of these propellers are shown as thus applied.

The claim is to the two cranks of different throws for each paddle-shaft, and the link and sliding brasses by which the two cranks of different throws are enabled to act in unison, and thus give any degree of an angle that may be preferred to the paddle-boards, both in entering and leaving the water.

James Warren, of Montague-terrace, Mile-end-road, *for an improved machine for making screws.* Enrolment Office, February 4, 1842.

The object of this invention is the enabling of moulds for casting screws to be made in moulding sand, by screwing patterns of the screws therein, and then withdrawing them by unscrewing, so as to leave patterns of such screws impressed in the sand, or such like material. Two rails, or tramways, are fixed lengthways on the top of a strong bench, upon which a plate of iron traverses to and fro, by means of four small wheels or rollers. A moulding head plate, having the patterns of the heads of the screws upon it, and properly gitted and sprayed, is placed in the sand tub, and a moveable iron moulding-box placed upon it; this box is then filled with sand, slightly pressed and levelled. A board is then laid on the top of the box, the usual way, and turned over, when the upper part of the sand will retain the impressions of the heads of the intended screws, and also of the gits and sprays. This box is then placed upon the iron plate on the carriage, with the patterns upward, and rolled under a screwing frame; three plates, the head plate, the steadying plate, and the guide screw plate, are brought down upon the moulding box, and secured there by studs. Each of these three plates contains as many holes as there are patterns used in the machine. In the upper part of the machine there are three cog-wheels, which are worked by turning a handle affixed to the middle one, and give motion to the outer two, to which the motion cranks are attached; these cranks give motion to a crank-plate, having the same number of holes as there are patterns employed. Each of the pattern screws terminates at top in a crank, which takes into the crank plate, so that on giving motion to the working cranks, all the screws are simultaneously turned round and screwed into the sand, by means of suitable guide-screws, &c. On reversing the motion, they are unscrewed and withdrawn, leaving the pattern of the screw impressed in the moulding sand. The screwing-frame is then raised, and the moulding-box drawn out, to make room for another. A corresponding moulding-box being filled with sand, its smooth surface is placed upon the impressed surface of the first, and being clamped together, the fluid metal is poured in. When the boxes are separated, the screws will be found perfect, except the nick or slit in the heads, which may be made with a circular saw, in the usual way; or the nicks may be cast in the heads of large screws, by making them in the patterns.

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal.*]

HORSE POWER FOR DRIVING MACHINERY; *George Strenge and Jacob Rohrer.* This is for an improvement in that kind of horse power in which the power is applied, by causing the horse to walk in a circle, and to draw by means of a lever or sweep attached to a vertical shaft; and it consists in the peculiar manner in which the levers or sweeps are attached to the main driving wheel. The patentees observe, that "sweeps of this description have heretofore been fastened to the main shaft, in such a manner as not to allow of their having any vertical play, in consequence of which, a considerable portion of the power of the horse or horses has been expended without the production of any useful effect, and has, in fact, been productive of injury, by racking the machine." In this machine the sweeps pass through staples attached to the main wheel, which staples are so formed as to confine the sweeps laterally, whilst they are allowed to play vertically. The inner end of the sweeps are received within mortises in the upper end of the shaft, and there are springs on the upper and lower sides of the rear ends of the sweeps, which bear respectively upon the main driving wheel and upon the upper part of the staples. The upper springs are provided with an off-set to operate as a latch in confining the sweeps in place.

STOPPING LEAKS IN HOSE; *Ralph Bulkley.* This patent is taken for a mode of stopping breaches in leather hose, whether small or large. Small breaches, or holes, are to be closed by a conical screw plug with a flat head. The point of the screw is to be inserted in the aperture, which, by screwing, is gradually enlarged, embracing the screw until the water is prevented from flowing out. But if the aperture be a slit passing lengthwise, it may be temporarily repaired for use by two corresponding plates of metal, the one to be placed inside of the aperture, and of sufficient length to cover it, there being a corresponding plate upon the outside of the aperture; the two plates are to be drawn together by screws, previously fitted to them, thus firmly binding the edges of the leather between the said plates of metal. If the aperture be so large, or of a description that it cannot be secured by such screws or plates, then a section of metal, or other description of pipe or tube, of suitable dimensions, may be inserted within the defective part, and the apparatus denominated "*breach clogs*" is to be applied thereto; but if the breach required to be stopped be not in itself large enough to admit of the application of the "breach clogs," the water hose may be severed by cutting it entirely across, or incisions of suitable extent may be made for the convenient and necessary application of the said apparatus. The claim is to the "mode of repairing lateral breaches in hose by means of screws, as set forth. Also of repairing larger breaches in the same by means of metallic plates and flexible tubes, inserted in hose, constructed and secured in the manner described."

IMPROVEMENT IN RIFLES AND OTHER FIRE-ARMS; *James R. Thomas.* This patent was granted for an improvement on that kind of guns in which a separate chamber, removeable from the barrel, is used. The separate chamber is made with a projection around the forward end of the bore, which fits into a recess in the barrel, the breech of the gun being made to receive the said chamber. Near the top of the back end, the chamber is provided with a hole, which receives the end of a spring bolt to hold it in place. The spring bolt is drawn back by a projection from the tumbler, which acts against an offset on the bolt, so that in bringing the hammer to the half-cock, the spring bolt is drawn out clear of the hole in the back of the chamber, and on cocking, the projection on the tumbler clears the offset on the bolt, and allows it to return by the action of a spiral spring coiled around it. A part of the lower part of the back of the chamber is bevelled off, so that in putting in the chamber, the bevelled part will force back the spring bolt until the chamber is in place. When the hammer is at half-cock, the chamber is forced up out of its place by a pin passing through a hole in the bottom of the case which receives the chamber; this pin is attached to the end of a spring screwed to the under side of the barrel.

EVAPORATING SOLUTIONS, DECOCTIONS, &c., FOR THE PURPOSE OF CONCENTRATING THEM; *James W. W. Gordon.* The patentee says, "The object of my improvement is principally to obviate the danger of injuring the preparation, which in articles of great delicacy sometimes takes place, by the application of the heat of a water or steam bath only; and this I effect by means of a machine which produces rapid evaporation at the ordinary temperature of the atmosphere."

FLYER FOR TWISTING SILK, &c., *Edward L. Young.* This flyer, instead of having two guide wires run out their whole length parallel to, and at equal distances from the axis, has one short and one long guide wire—the short wire, or arm, extends as far only as the middle of the bobbin, and the longer arm extends to some distance beyond the end of the bobbin, and is there

curved so as to bring the guide in a line with the axis of the bobbin—the guide wire being sufficiently long to admit of putting on and taking off the bobbin without moving the flyer. A ring is attached to the two guide wires of this flyer, near the extreme end of the short arm, to prevent the centrifugal force from throwing out the guide wires which constitute the flyer.

The claim is to the method of constructing the flyer.

FIRE ARMS; *Silas Day*. This patent is obtained for an improvement on that kind of fire arms that load at the breech, and it consists in making a curved chamber at the breech, which opens at the side of the barrel, for the reception of the load. The side aperture is closed by a valve which works on a pin and is provided with a handle and catch; the valve works in a slot made in a block of iron that projects from the side of the barrel, and in which block a part of the curved chamber is made.

"I am aware," says the patentee, "that guns have been made to load at the breech by having a sliding valve to close the aperture through which the charge is inserted, but not constructed like the plan herein described, and therefore I do not claim the principle of loading at the breech as my invention, but what I do claim as my invention, and desire to secure by letters patent, is the curved chamber, and in combination therewith the sliding valve and its appendages, consisting of the slot and lever, for the purpose, and in the manner herein described.

CUTTING SCREWS ON THE RAILS OF BEDSTEADS; *Jacob Lindley*. The ordinary method of cutting screws upon the ends of bedstead rails, is well known to all who are acquainted with the making of such articles. In the improved mode, the rail is held in the middle by a clamp attached to a bench, on each end of which there is a puppet head in which works a screw, mandrel, or shaft, provided with a winch on its outer end, and on the inner end of each of these is fitted a socket, very similar to those usually employed for cutting wooden screws, excepting that they are made of steel, and the cutter is formed by it, instead of being attached thereto. These sockets are fitted on to the inner ends of the screw, mandrel, or shaft, by a socket, and secured by a thumb screw, by means of which the precise point at which the threads, on each end of the rail shall end, can be regulated. That end of the socket, on which the cutter is situated, is bevelled off, and the cutter is so formed as to cut under the shoulder.

The claim is to the "manner of forming the cutters for cutting the screws on the ends of the rails, by making them a part of, and one with, the sockets, or female screws. Also, the manner in which I have combined and arranged these sockets, the screw shafts, and standards (puppets) with each other, for the purpose set forth."

MACHINE FOR CUTTING CORK; *Charles R. Macy*. The pieces of cork, called blocks, cut into proper lengths, are held between two revolving spindles which grip them, and as they revolve, the cork is cut round by a revolving cutter wheel, the arbor of which is horizontal and has its bearings in a sliding frame. This frame rests upon two cams, on a shaft parallel to, and under the shaft of the cutter wheel, the cams being of such form as that at the commencement of each operation the frame and knife will be lifted up, and cause the edge of the cutter wheel to approach the piece of cork to be cut, and when the cork has been cut, the frame and cutter wheel are let down to allow the revolving gripes to receive another block. The edge of the cutter wheel is kept sharp during the operation, by means of two rotary disks, one acting on each face. The faces of these disks are covered with leather, and emery, or any other substance which will give an edge. As the cutter wheel revolves, to cut the cork, every part of its edge is brought round to these grinding disks. The blocks are fed in through a box, from which they are taken by a jaw which slides forward and places them between the gripes of the revolving spindles.

The claim is, first, to the "combination of the rotary cutter wheels with the sharpening rotary disks, one on each face of the rotary cutter for the purpose and in the manner described.

"Secondly, to the method of moving the rotary cutter wheel up and down at the commencement and end of every operation by means of the sliding frame, acted upon by the cams, for the purpose and in the manner described.

"And thirdly, to the method of feeding the machine with the block by means of the slide and jaw, in combination with the receiving box and spindles as herein described."

The attempts at cutting corks by machinery have been numerous, and have uniformly proved failures; not that corks have not been cut by machinery, but because they have not been so well cut as by hand, and because the preparing and assorting of the blocks to be cut by the machine have required a degree of care and attention which are not repaid by the result.

IMPROVEMENT IN THE MANUFACTURING OF CLOTHS OF WOOL, OR WOOL AND SILK;

R. Daniels. "The improvement consists," says the patentee, "in the remanufacture of wool into cloths of various kinds, such as broadcloths, kerseymeres, satinets, and others of a similar character, and into cloths in which the warp consists of cotton, silk, or other material, and the filling in whole or in part, of wool; or of cloths in which the cotton, silk and wool are mixed together, and are carded and spun in their combined state; all of which I have successfully essayed. The wool so remanufactured I obtain by taking worn-out woollen goods of various kinds, and also worn-out silks, and reducing them to their original state by means of machinery which I have invented for that purpose (and for which I have made application for letters patent, simultaneously with the present application) or reduced by means of any other machinery which will produce said fibres of wool in a state fit for remanufacturing into yarn and cloth.

"I sometimes take such restored wool, and card, spin, and weave it, alone, or I mix it with fresh wool in proportion of, at least, one-sixth part of the restored wool to five-sixths of the fresh wool, and I, in either case, thereby obtain yarn or cloth equal in all respects to that which can be obtained from either fresh, or new, wool of the same degree of fineness, a result not heretofore obtained, and by which I am enabled to produce such cloth, and sell it at a price considerably lower than that of cloth consisting entirely of fresh, or new, wool; as it is a fact which I have established by full experience that the reproduced fibres of wool may be obtained from the worn-out woollen goods, pound for pound, at a very trifling cost."

NOTES AND NOTICES.

A Scientific Commander.—Captain Carpenter is having the pinnace of the *Geyser* Steam Frigate, to which he has been lately appointed, fitted with his own patent propeller. The Admiralty have given permission to have a small engine of 5 or 6-horse-power from the Disc Company for the purpose. There is little doubt of this portable steam-tug being of great service in towing boats with troops, &c., up the rivers and canals in China, to which station the *Geyser* is supposed to be destined. Notwithstanding the number of steamers in the service now, there is not one of Her Majesty's steam-vessels employed either in India or China.—*Times*.

Levels of the Mediterranean and Dead Seas.—At a recent meeting of the Royal Geographical Society, a letter was read from Colonel Chesney, stating that a line of levels had been carried from Jaffa to the Dead Sea by Lieutenant Symonds, of the engineers. The work is said to have come out admirably, and the result is, that the Dead Sea is 1,607 feet lower than the highest house in Jaffa, which, from the height of Jaffa above the Mediterranean, leaves a difference of 1,400 feet between the level of the two seas.

Steam Engines in Belgium.—It is estimated that there are now at work in Belgium 1,800 steam engines, with a total power of 33,100 horses.—*Galignani's Messenger*.

The Little Western.—The proprietors of this steamer (the building of which was announced at page 293 of our last volume), accompanied by several captains of the navy, and gentlemen connected with the commercial and with the scientific and engineering interests of the country, had on the 27th ult., an experimental trip down the river, in order to test the speed and powers of the vessel. The Little Western left her moorings off the Brunswick Hotel at a quarter to 11; the tide then running down, and the wind blowing from the south-west. There was, however, but little wind, and the weather was clear and pleasant. She was accompanied down the river by one of the fastest boats, viz., the Railway, for which she waited off Galleons, and with which she contested head and head to Gravesend. The speed of the Little Western is extraordinary; she reached the Nore Light within 2 hours and 55 minutes from the time of starting, and returned to Blackwall within 2 hours and 25 minutes. The distance is 44 miles. This vessel is built on an improved principle. Her tonnage measurement is a fraction beyond 721 tons. She measures between perpendiculars 200 feet, measurement over all 216 feet. Her keel measurement is 195 feet. Her breadth, clear of her paddle-boxes, is rather above 27 feet; and her breadth over all exceeds 47 feet. Her deck is flush from stem to stern, and she has two masts. Her internal accommodations are very good, as may be surmised from the measurement of her saloon and cabins, &c. The length of her saloon is nearly 44 feet, and the room is elegantly and commodiously fitted up, without being gaudy or fantastic; it is also a good height, and is 24 feet wide. The ladies' cabin is nearly 20 feet long. The engines, which are horizontal and low pressure, are of 80-horse power each. Altogether she is a most elegant craft, and an admirable sea-boat; she has weathered a gale off the Land's-end, and proved her capability to contend against a rough sea and a heavy wind. This vessel was built at Bristol, by Messrs. Acramans, Morgan, and Co. She is a vessel excellently adapted for the London and Ramsgate station. Her prodigious speed, superior accommodation, and tractability, render her peculiarly desirable for trips in which convenience and rapidity are imperative.—*Times*.

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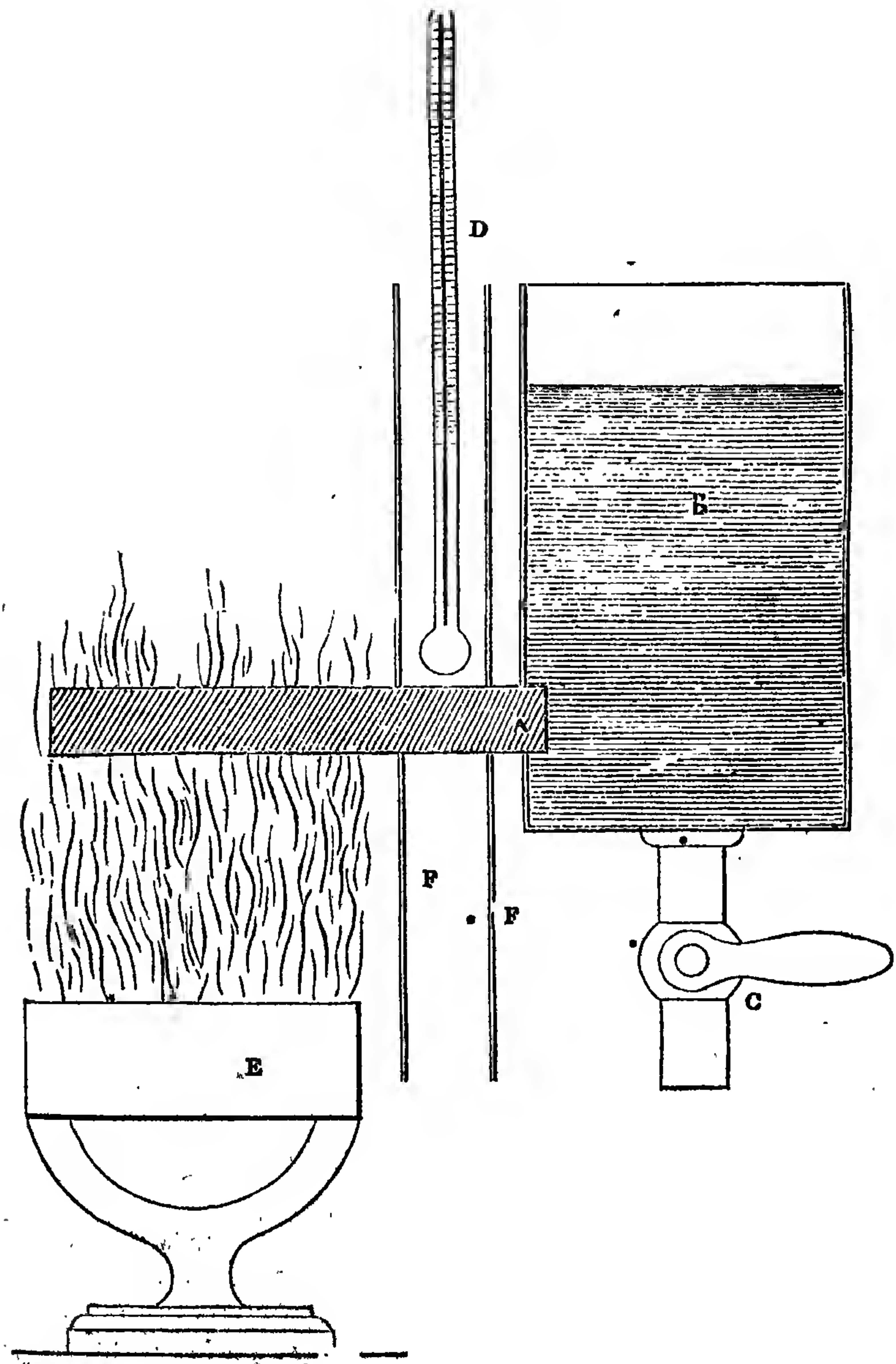
MR. C. W. WILLIAMS'S HEAT CONDUCTOR BAR.—(ILLUSTRATIVE OF STATICAL AND DYNAMICAL HEAT.)



ON THE CAUSES OF INJURY TO STEAM BOILERS. BY. C. W. WILLIAMS, ESQ.

Sir,—In my last communication, I explained some of the reasons which justified our considering that the sources of injury to boilers, (as regards the overheating of the plates,) were referable to the character and heat-absorbing properties of the recipient to which the heat was transferred. I then enumerated the five recipients which present themselves in ordinary boilers, namely, 1. Water; 2. Steam; 3. Air; 4. Incrustation deposit, crystallized; 5. Loose deposit, uncrystallized. Having already examined the conducting powers of the two latter, I have now to consider those of the three first mentioned.

Water is, unquestionably, the most rapid and best recipient for ordinary purposes, and air the slowest and worst. So long as the water in boilers remains in contact with, or has free access to the plates, the latter will sustain no injury, inasmuch as the body or stream of heat passing from the fire, and through such plates, by reason of the superior conducting power of the metals, will be taken up by the water as rapidly as it is passed to them. Hence, the plates themselves—the conductors—remain uninjured, and unaffected, beyond a certain temperature. What that temperature is, I trust I shall be able hereafter to demonstrate, with sufficient accuracy for all practical purposes.

That the plates or conductors remain uninjured by the transmission of heat, even of great intensity, may be illustrated by the following experiment. In the prefixed figure, (see front page,) let A represent an iron conductor bar, three-quarters of an inch square and three inches long, one end being inserted into the vessel B, containing water, and the other end projecting so as to receive the heat from a powerful laboratory Argand burner, E; the intermediate part at G, between the flame and the boiler, being protected by two shields, F F. The flame was inclosed, as is usual in laboratory burners, with a metallic funnel, resembling the glass funnels of ordinary lamps, the bar passing through an aperture in it, made to fit. By this means the heat was confined, and its action on the bar was very great. This funnel is omitted in the drawing, for simplicity sake. Immediately over the conductor bar, though at first not in contact with it, is placed the thermometer D, further protected by the two shields.

In five minutes, the heat conveyed by the bar raised the temperature of the water to 92°, and the bar thermometer to 160°. In twenty minutes, the water reached 212°, and boiled, the bar thermometer being raised to 258°, at which it remained stationary. Here we see the entire heat taken up by the water was passed through the conductor bar, issuing, as it were, from its end at A, and through a section of the boiler side, of but three-quarters of an inch square. The thermometer was then lowered until it rested on the bar, when it rose to 270°, and there remained stationary, the water boiling strongly.

Here we have two distinct temperatures, and two measures of heat. The first, that which is felt by the bar, I will call *statical* heat, that is, the heat due to its *status* as a conductor; the second, that which indicates the current or body of heat conveyed: this I call the *dynamic*, or power-giving heat. These terms, *statical* and *dynamical*, I use from the want of others more appropriate; they are, however, sufficiently indicative of the distinction I am pointing out. I am now desirous of establishing the fact, that the degree of heat by which the conductor may be said to be affected is different from that which is transmitted through it. That there are, in fact, two distinct temperatures or degrees of heat to be attended to; the one, that which the plates or conductors may be said to feel, and which indicates the extent to which their structure or material would be affected; the other, that which is conveyed to the recipient, water, and which it absorbs.

Now, to show that these two temperatures are distinct, and that their relation to each other is solely influenced by the absorbing power of the recipient, I give the following proof.

The bulb of the thermometer indicating the statical heat stands at 270°, and remains stationary at that point, the water continuing to boil violently. To prove that this statical heat, whatever it may be, is affected by and dependent on the nature of the recipient, let such recipient be changed from water to air. This is done by turning the cock C, thus letting

the water out, and allowing the air to have access to the end of the bar at A, from which the heat issues. Air being now the recipient, the current of dynamical heat passing through the conductor bar is not received or absorbed as rapidly as it had previously been, by reason of the inferior absorbing power of the air, as compared with water. The result is, that the current of heat, in its issue at A, being retarded, accumulation takes place in the conductor, the statical heat is increased, and the thermometer instantly tells the fact by rising until it reaches 404, as shown in the following table.

Time in minutes.	Thermometer resting on bar.	Temperature of the water.
0	44	40
5	160	92
10	214	138
15	245	188
20	258	212
25	,,	,,
30	270	Bulb resting on conductor bar.
35	,,	
40	360	The water being run off, and the recipient changed to air.
45	392	
50	398	
55	404	
60	,,	

Thus we see, that so long as water was the recipient, the statical heat—that by which the metal would be affected, injuriously or otherwise—remained at 270°, but, with air as the recipient, it rose to 404°. This statical heat, then, as it indicates the state or temperature of the conductor plates, decides the main question of injury to the boiler; for if the temperature of those plates is thus kept down by reason of the rapidity with which the water absorbs the conducted heat, it necessarily follows, that it cannot amount to such a degree as to affect those plates by overheating, softening, or bulging. This is the practical application of the subject. Thus we see that the temperature of the plate is dependant, not on the quantity or intensity of the heat passing through it, but on the nature of the recipient, and the rapidity with which such heat is absorbed or taken up.

We have thus, I repeat, two distinct temperatures to attend to, namely, the *statical*—that due to the plate or pin, in the capacity of carrier, conductor, transmitter, or conveyer—and the *dynamical* heat, that due to the current or quantity conveyed. The former, we see, is dependant on the latter; in other words, the temperature of the conductor plates of a boiler is high or low, injurious or otherwise, in proportion to the rapidity with which the conducted heat is absorbed by the water or other recipient. I will hereafter show the analogy between this stream of heat passing through the conductor, and the pressure of water through a tube; and that the same statical and dynamical distinction may there also be drawn. In proof of the temperature of a conductor plate or pin being below that of injury or overheating, so long as water is the recipient, I have placed several pins in boilers, projecting from two to four inches, and exposed to the most intense heat, even where the adjoining brick-work was at a white melting heat. These pins, nevertheless, remained uninjured, and doing their duty as conductors.

I may here mention a familiar experiment, which illustrates the fact of the conductor not being injuriously affected by the transmission of heat through it, so long as the recipient possesses the absorbent property which water has. I inserted a bottom, made of a circular piece of card paper, two inches diameter, and made to fit tight, into a tin vessel, and, by means of a little glaziers' putty, made water-tight round the edge. On being held over an Argand lamp, the water it contained was made to boil, while no injury, even to discoloration, took place in the card-bottom conductor; and on being removed from the lamp, it was found to be apparently cold to the touch: thus proving, that although a high degree of heat, dynamically considered, was flowing through this piece of card, the statical heat of the latter was insufficient to injure it.

This leads us to examine the commonly received idea, that the durability of boiler plates will be influenced by the temperature of the furnace, and the degree of activity with which the fire is urged, and which subject I will examine in my next.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, February 12, 1842.

COMPOUND INTEREST.

Sir,—A question put to me some little time ago by a friend, led to the following calculation, the result of which is curious, and may perhaps be new to some of your readers who may take an interest in such matters.

Let £P be put out to compound interest at the rate of r per cent. per annum, and let A be the amount it will produce at the end of n years; then, according to the ordinary formula,

$$A = P\left(1+\frac{r}{100}\right)^{n}.$$

Or, supposing for the sake of simplicity, P = 1, and making $\frac{r}{100}$ = a (the simple interest of £1 for a year at the given rate per cent.,) we have,

$$A = (1+a)^{n}.$$

In this formula it is assumed that, according to common usage, the interest is made payable and added to the principal *yearly*, the amount for 1 year being only $1 + a$, or the same as the principal would produce at *simple* interest merely; but it is evident that there is no reason, except a conventional and arbitrary one, why the period of *a year* should be chosen for this purpose, or why the sum should not bear compound interest during the first year; the interest might, if it were thought proper to do so, be made up *half-yearly;* the interest then due for every one of these periods of half a year, at the same rate as before, would be = $\frac{a}{2}$, and, n years being equivalent to $2n$ periods, our formula would become, upon this supposition,

$$A = \left(1+\frac{a}{2}\right)^{2n}.$$

Similarly, we might make the interest payable *weekly*, in which case,

$$A = \left(1+\frac{a}{52}\right)^{52n},$$

or, generally, if the year were divided into x periods, and the interest added to the principal at the end of each of these periods, the equation would be,

$$A = \left(1+\frac{a}{x}\right)^{nx},$$

the value of A depending upon the magnitude given to x.

Now, if these periods have any finite value, however short it may be, the accumulation or adding of the interest to the principal will take place at intervals some finite distance from each other; but it is easy to conceive, that by *indefinitely increasing* x, this distance may be so diminished as to become inappreciable, and thus the principal and interest may be supposed to accumulate together, *continuously*, instead of by skips, this continuity being the limit towards which we approach by making x indefinitely large, or the period of time allowed for making up the interest indefinitely small. The amount of £1 for 1 year, would then no longer be simply $= 1 + a$, but $= \left(1+\frac{a}{x}\right)^{x}$, where x is infinitely great in value.

This may perhaps be said to be what the law of continuity would seem to suggest as the true theoretical view to be taken of the nature of compound interest, and it may become a question (perhaps, however, rather curious than useful), what difference does this mode of considering it make in the amount? Or, what amount would be produced in n years, by £P put out to compound interest, supposing the principal and interest to accumulate together *continuously*, instead of at intervals of 1 year, as upon the ordinary system?

It will soon be perceived, that the value of the expression $\left(1+\frac{a}{x}\right)^{nx}$ increases when x increases, and it has therefore been supposed by some, that when x becomes infinite, A will become infinite too; or, in other words, that A may be made as large as we please by taking the value of the interest period sufficiently small. This, however, is not the case; we shall find that the expression approximates continually more and more as x is increased, towards a certain limit, which it can never exceed, and therefore this limit will be the value of A of which we are in search.

Expanding $\left(1+\frac{a}{p}\right)^{nx}$ by the binomial theorem, we find it equal to the following series:—

$1+na+n\frac{nx-1}{2}\frac{a^2}{x}\cdot+n\frac{(np-1)(np-2)}{2\cdot3}\frac{a^3}{p^2}$ + &c. Or, if the terms be multiplied out, $= 1. + na + \frac{n^2a^2}{2} - \frac{na^2}{2p} + \frac{n^3a^3}{2\cdot3} - \frac{3n^2a^3}{2\cdot3\cdot p} + \frac{2na^3}{2\cdot3p^2} +$ &c.; which is a series consisting partly of terms not containing x, and partly of those which have powers of x only in the denominators. Now, it is obvious, that by making x sufficiently large, the whole of the latter may be brought as nearly as we please to 0; so that by omitting these, we have, for the *limit* of the expression,

$$A = 1 + na + \frac{n^2a^2}{2}\quad\frac{n^3a^3}{2\cdot3} + \frac{n^4a^4}{2\cdot3\cdot4} + \&c.$$

But this series is known to be the one for ε^{na}, (ε being = 2·718, &c., the base of the Napierian system of logarithms,) whence A $= \varepsilon^{na}$, or in other words, the amount produced in n years by £P put out to compound interest at r per cent. per annum, upon the *continuous* hypothesis, will be = P × number to Napierian log. $\frac{nr}{100}$; or = P × natural number to *common* log. $\frac{nr}{230\cdot258}$.

An example or two will show the difference between the results of this and the common supposition.

The amount produced by £100 at 100 per cent. per annum, in 1 year, would be, on the common supposition = 100 $(1 + 1)^1$ = £200.

On the continuous hypothesis = 100 × anti-log. $\frac{100}{230\cdot258}$ = 271*l.* 16*s.* 0*d.* nearly.

The amount of £1000 at 5 per cent. per annum, for 20 years, would be,

On the common supposition = 1000 $(1\cdot05)^{20}$ = 2653*l.* 6*s.* 0*d.*

On the continuous hypothesis = 1000 × anti-log. $\frac{100}{230\cdot258}$ = 2718*l.* nearly.

The same for 100 years.

On the common method = 1000 $(1\cdot05)^{100}$ = about 131,500*l.*

On the continuous hypothesis = 1000 × anti-log. $\frac{500}{230\cdot258}$ = about 148,400*l.*

I am, Sir, yours obediently,

W. Pole.

Bloomsbury, February 3, 1842.

IMPORTANT TO MANUFACTURERS OF GLASS, PORCELAIN, POTTERY, ETC.—NEW MATERIAL DISCOVERED.

Sir,—It is well known that the Americans are endeavouring to supply themselves with earthenware, and that they are in *possession* of the *materials*, which at some future day *may* be made a greater use of. In order to retain the superiority in making pottery, porcelain, &c., that Staffordshire has hitherto had, we must not only consider the best mode of combining our earths and minerals, but also the cheapest plan of obtaining them. Under this impression I have succeeded in obtaining a material which is likely to be extensively used in the fabrication of glass, pottery, porcelain, &c. It possesses one great advantage over articles of similar properties now in extensive use, that of being *cheaper*. It may be obtained in any quantity, at any season of the year, and delivered in the potteries at a *less price* than *flint* or *clay*. It is free from any *metallic* mixture, and does not contain (excepting an almost imperceptible portion of carbonate of lime,) anything but pure *silica* and *alumina*, of which there are about four-fifths of the former, and one-fifth of the latter. It would not require the expensive and tedious process of burning and stamping like flint, but merely grinding from a state of *siliceous sand* to powder; and containing already one-fifth of alumina, would only require an addition to be fit for the potter's use. It is difficult to meet with such a *pure alumina—siliceous* compound in nature. The silica has been extracted easily by *water* from the native earth and *used* at Birmingham and St.

HELEN's in the manufacture of FLINT and PLATE GLASS, and was found equal, if not superior, to the sand from the Isle of Wight, now in such general use.

Any manufacturer wishing to make a trial of this new production, may have a sample on application to the writer.

SAMUEL SALT.

Liverpool, 32, Mulberry-street, Feb. 9, 1842.

PATENT FIRE-PREVENTIVE PLASTER, VINDICATED FROM THE ASPERSIONS OF COLONEL MACERONE.

" ——— He has been bred i' the wars since he could draw a sword, and is ill schooled in boulted language; meal and bran together he throws without distinction."

Sir,—I had hoped that my last communication on this subject would have sufficed to show Colonel Macerone, that he was greatly mistaken with reference to the properties of the Fire-preventive Cement; and that he had better either obtain more correct information, or be silent upon this subject.

By your last Number, however, (page 116,) I perceive that my friendly caution has been thrown away—

"He winna tak the hint."

On the contrary, he continues to write most disparagingly of the "anti-phlogistic plaster," *alias*, "the bubble cement:" with what *justice*, your readers shall be enabled to determine.

The highly satisfactory experiment in Dorset-street, Clapham-road, on the 6th of June, 1838, and the (if possible) still more conclusive demonstration of the efficacy of this composition, in Trafford-street, Manchester, on the 23rd of October following, have been duly recorded in your Gazette. Similar public exhibitions have been made in New York and St. Petersburgh. Many private experiments have also been witnessed by architects, builders, &c., and by the officers in connexion with Her Majesty's Board of Ordnance and Dock-yards, Colonel Fanshawe, Captain Jebb, Mr. Ewart, Mr. Lloyd, Mr. Sylvester, and others, who not only expressed their confidence in its properties, but have given orders for its use in the *Lucifer* steam ship, and the Model Prison erected under the superintendence of the Commissioners of Woods and Forests; the experiments having satisfactorily demonstrated that the "Patent Fire-preventive Plaster" is a complete protection against the spreading of fire, in all the possible casualties of ordinary conflagrations.

Witnessed, as these experiments have been, by the highest and most competent authorities, it is perfectly futile for Colonel Macerone, at this time, to misrepresent the facts, or to underrate the value of the protective powers of the composition.

In order to show his intimate knowledge of the ingredients of which the fire-preventive plaster was composed, Colonel Macerone says, "I took a portion of it home, and found it to consist of Roman cement, size, and alum." The mode of chemical analysis by which the Colonel can resolve *one composition* into *another* must be a very singular process. Unfortunately, however, either for Colonel Macerone's honesty, or for his chemical skill, no such matters as Roman cement or alum enter into the composition of the article in question; and I am the more surprised at the temerity of Colonel Macerone, in venturing to put forth such mistatements upon this subject, because the actual components of this plaster are no secret. The specification of the patent, duly enrolled, gives the public free access to all the information they can desire upon this head. The basis of the fire-preventive cement or plaster is, *slate* and *calcined river sand.* The refuse pieces of slate are ground to a fine powder, and with the sand are boiled with a small quantity of tar, rosin, and the strongest glue, or other animal gelatinous substance. When brought to the required consistence, the mixture is dried, powdered, and packed in casks for sale. When required for use, it is tempered with water, as in mixing common mortar.

Colonel Macerone further states, that at the house in Dorset-street, *he saw* "the tubs of Roman cement, those of size, and others, which, not being opened, I cannot swear that they contained the alum." No such materials as Roman cement, size, or alum, were on the premises;* the "preventive cement" was delivered in *tubs* ready for use, requiring nothing but the addition of a proper quantity of water. Indeed it is necessary to mention, by way of caution to par-

* Surely if such ingredients composed the plaster, they would have been combined in the *manufacture*, not in the *using!*

ties using the preventive plaster, that *Roman cement*, if mixed with it, *spoils it*. Such a mixture greatly impairs its antiphlogistic powers, and never hardens properly; I have seen specimens which remained soft and friable, while the cement alone attained a stone-like hardness.

The determined hostility with which Colonel Macerone has all at once attacked the fire-preventive plaster—professing as he does, to be a fellow labourer in the cause of "fire prevention"—is most surprising. Nor will I pretend to explain the wherefore. Neither can the materials, of which the fire-preventive cement is composed, be of any very great consequence, so long as it retains the remarkable fire-resisting properties, which every trial has hitberto proved it to possess.

Without pursuing the subject further, I beg to remain,

Sir, yours respectfully.

WM. BADDELEY.

February 14, 1842.

MECHANICAL CHIMNEY SWEEPING.

Sir,—On reference to page 337, vol. ii., of your instructive Magazine, you will find fully described by G. W. T., with drawings, the first and best of the plans suggested by your correspondent, Mr. Emslie, in a recent Number. An improvement upon this plan I first made public in 1837, the object of which was to obviate the necessity of going on to the top of the house every time a chimney required cleaning. A model of my improvement is exhibited in the Polytechnic Institution, Regent-street, and may be described as follows:—Across the top of the chimney or chimney-pot, rather to one side, is placed a round bar of iron, over which runs a small *endless* chain, (jack-chain,) or incombustible rope, descending to the fire-place, where it passes under another round bar, placed in any convenient corner at the bottom of the chimney, to prevent the chain from twisting. A whalebone brush, or wisp of heath, &c., is to be attached to any part of the chain or rope, and by moving it up and down, it will effectually bring down all the soot, however crooked the chimney may be. This accomplished, detach the brush, clear away the soot out of the grate, and place the lower end of the chain at the side of the chimney. It will be necessary to have a chain or rope hung in each chimney. The only objection I can see to this plan is, that in the course of time the chain or rope will be apt, in rubbing against any acute angles, to work into the joints of the bricks, as chimneys are now constructed. To obviate this, I propose to insert in the chimney, where any very acute angle occurs, a metal brick, with one of its corners well rounded, which would form an easy surface for the chain or rope to pass over.

To all straight chimneys, the jointed rods, (Glass's machine,) are well adapted, and as one set will answer for many chimneys, they will on that account be found the most economical. If the above plan were generally adopted, it would only be necessary for adult sweeps to go about in the morning with brushes of two or three sizes to attach to the chain or rope, and a bag to carry away the soot.

Should you think the above worthy of insertion in your valuable Magazine, you will further oblige, Sir,

Your most obedient servant,

A. M'GILLIVRAY.

38, Clarendon-square,
Feb. 1, 1842.

MECHANICAL CHIMNEY-SWEEPING — MR. EMSLIE IN REPLY TO MR. BADDELEY.

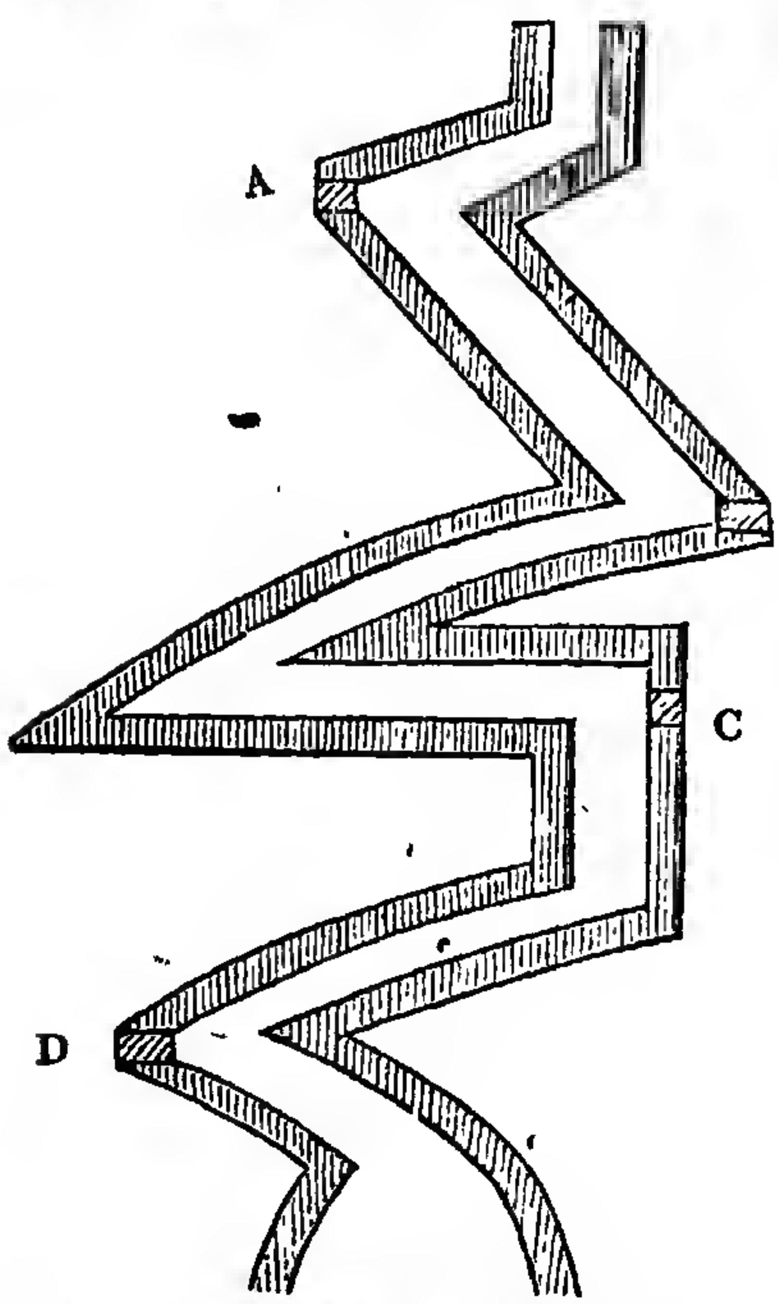
Newcastle-upon-Tyne,
Feb. 9, 1842.

Sir,—I feel assured you will do me the justice to give early insertion to a few words in reply to the strictures of Mr. Baddeley, on my plans for mechanical chimney-sweeping, published in your 964th Number.

I am, indeed, much obliged to Mr. Baddeley for giving me credit for motives of humanity in submitting these plans to the public; but, after showing himself so strenuously adverse to the employment of little children in the sweeping of chimneys, I think he might have left his mind open for the unprejudiced consideration of every variety of suggestion for the introduction of mechanical means, instead of so strenuously advocating one invention, to the exclusion of all others.

Could I have persuaded myself that Mr. Glass's machine was a perfect instrument for the purposes in question, I should not have troubled myself to devise new means. I uphold, however, and shall demonstrate this—that the *rope, weighted brush, pulley*, and *flue-door mode* is much superior to Mr. Glass's, in many instances. It is all very well for Mr. Baddeley to say, "There is no chimney in existence, capable of being swept

by the *weighted brush*, that could not be swept far better, and with less injury, by Glass's machines." But where is the proof of this? Mr. Baddeley cannot expect that the public will take his mere assertion of the thing as an absolute fact. I may with more reason, I think, ask—Can a single flue be pointed out, which Glass's machine is capable of cleansing, that the weighted brush mode is not equally able to effect? I am sure that all those who understand the respective properties of both methods, and are disinterested as to the success of either, will answer in the negative. Suppose the question reversed, what do we arrive at? Why, at this; that by numerous soot-doors the most perversely constructed chimney may, by Glass's machine, be swept; but that by many fewer contrivances, and much more easily, the same construction of chimney may be effectually cleaned by the weighted brush. The following sketch will illustrate the difference:—



A B C D are soot-doors, which I think Mr. Baddeley will allow would be required for sweeping a chimney of the intricate construction here represented, (I give it such a form for the sake of clearer illustration, though I should hope few such exist,) by means of the machine he so strongly advocates; whereas by using along with my suggested flue-doors and pulleys a long handled scraper, (evidently a more useful article for cleansing horizontal flues than a brush,) only the apertures A and C would be required. It is also apparent that the lodgement of soot which would take place at those parts of flues similar to that lettered E could not be removed by Glass's brush. A very great advantage likewise attending the pulley and rope is, that they can be made of very great use in the formation of a scaffold in the interior of the chimney, for the performing of any repairs therein.

Wishing every success to the "good cause,"

I am, Sir,
Obediently yours,
JAMES A. EMSLIE.

IMPROVED CANDLE HOLDER.

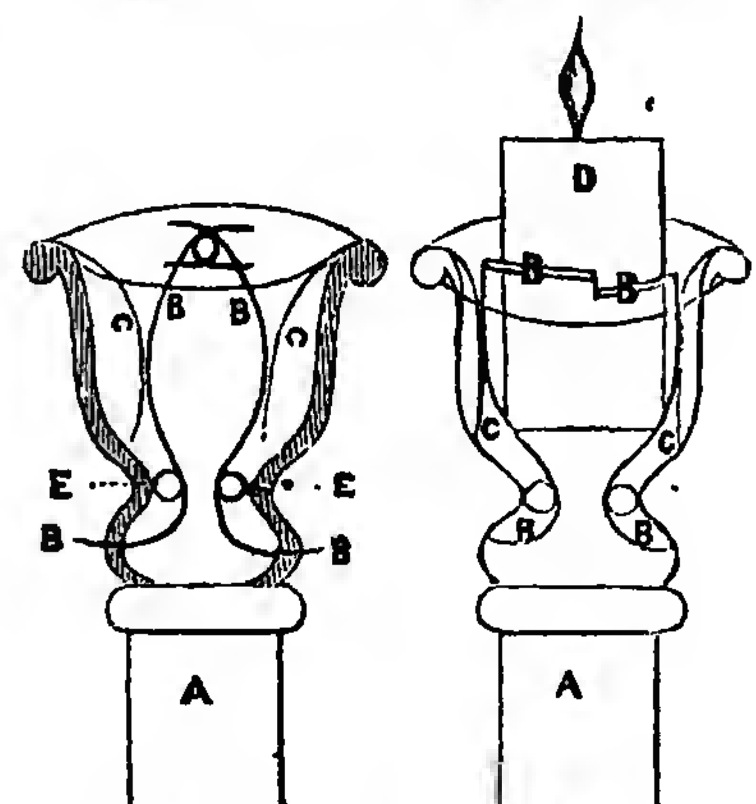


Fig. 1. Fig. 2.

Sir,—Should the above design for a candle holder be deemed worthy of a place in your valuable Magazine, it may be the means of preventing many a spot of grease from candles being awry in their sockets.

A, the candlestick.

B B, the candle holder.

C C, two springs on each side of the socket to keep the holder against the candle.

E E, two pins holding the candle holder in its position, and sufficiently loose to allow it to play.

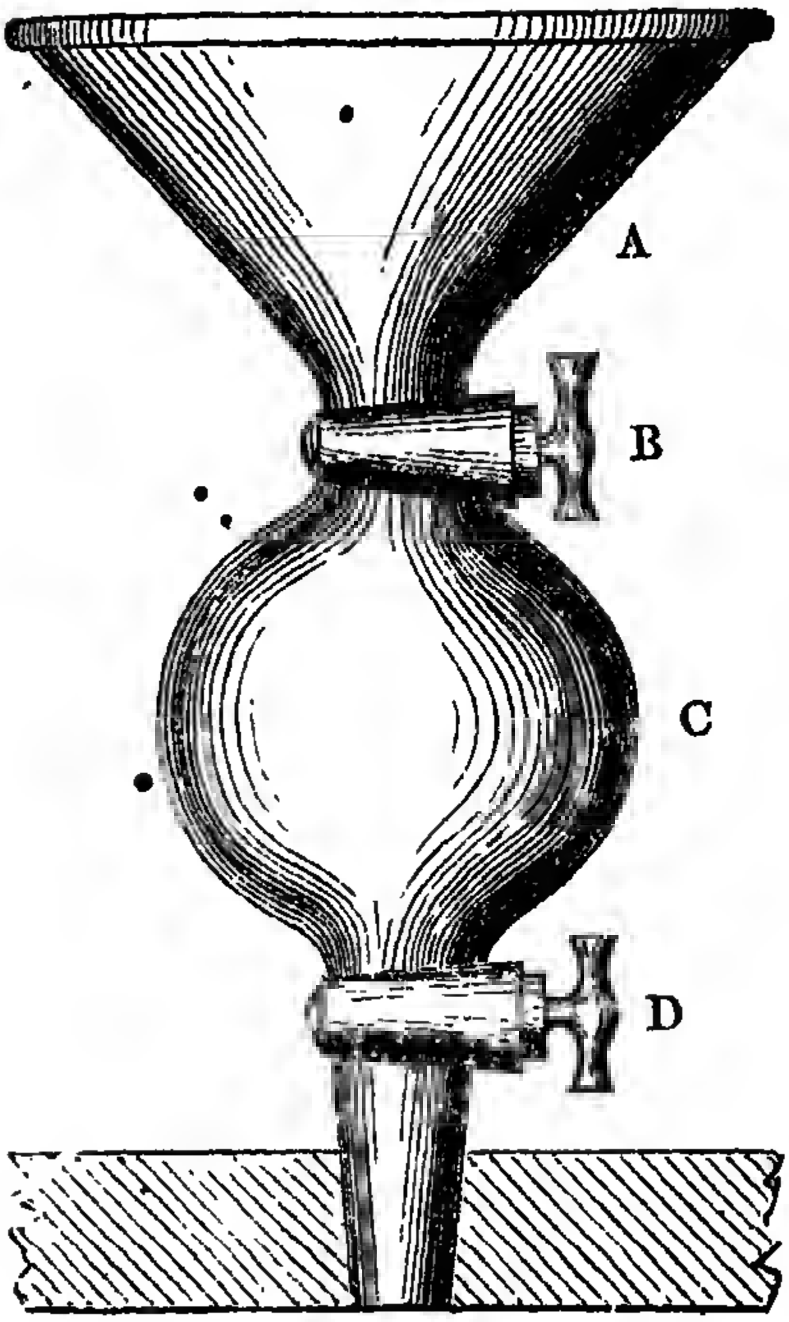
D, the candle.

Press with both fingers on the two lower ends of B B, protruding, as at fig. 1, which will open the holder to admit the candle being placed, as seen at fig. 2.

I remain, Sir,
Your obedient Servant,
J. B. B.

Guernsey, November 22, 1841.

IMPROVED GREASE CUP FOR STEAM-ENGINES.



Sir,—A few days ago as I was viewing the operation of a newly-erected steam-engine, I thought proper to open the cock in order to empty the grease cup into the cylinder. But instead of doing this during the ascent of the piston, that is, when the space above the piston was void, I unthinkingly did it during the descent; the consequence was, that the steam blew out the contents of the grease-cup with very considerable force, and scattered them all over me. To save others from being exposed to such accidents, I beg to suggest that the cup should be formed in the manner represented in the prefixed sketch. It will be advisable, previous to allowing the oil or tallow to enter the cistern C, to extract the air therefrom, by closing the cock D, when a vacuum will be produced immediately beneath: also to make the cistern C a little larger than A, in order to preserve a small portion of air above the tallow, after the cock B is closed, the expansion of which would, on opening the cock D, cause the oil or tallow to leave the cistern more freely.

I am, respectfully, yours, &c.

FRANCIS HAROLD.

BURSTING OF PIPES.

Sir,—In No. 966, Mr. Baddeley has given an account of the bursting of a pipe under peculiar circumstances, which he designates a "Singular Phenomenon." I was surprised that Mr. Baddeley, with his stock of general knowledge, should find the solution difficult.

My explanation is this:—That part of the pipe situated outside the house being colder than the portion which is inside, acted as a condenser to the vapour rising from the surface of the water in the shorter leg of the syphon. The vapour, as it became condensed upon the sides of the colder parts of the pipe, would descend to the stop-cock at the lower end, and would accumulate there. The frost would perform the remainder of the operation.

By the rising and falling of the water in the cistern, and consequently, in the shorter leg of the syphon, the inclosed air would be alternately compressed and dilated, which would increase the evaporation, as the variable density of the air would give it different capacities for retaining the aqueous vapour; and, by the falling of the water in the shorter leg, the sides of the pipe would be left wet, and thus the evaporating surface would be much increased, forming a complete distilling apparatus upon a small scale. It may be asked, why the pipe should burst at a distance of 9 inches above the cock? The answer would be, that the water is supposed to have stood at that height, and the upper surface becoming frozen first, would strain the pipe in that part, and the condensation still going on, would cause the ice to accumulate there and complete the fracture.

If this view of the case should be deemed satisfactory, perhaps it may assist in the explanation of the bursting of gas pipes, for they are subject to accumulations of a fluid, more or less watery, in the lower situations, and are liable at times to be frozen.

Yours respectfully,

T. CLAXTON.

29, Harrington-street North, Hampstead-road, February 14, 1842.

[Somewhat similar explanations have been furnished by S. E. A., and An Old Subscriber.—ED. M. M.]

PNEUMATIC RAILWAY BUFFERS.

Sir,—Seeing in the *Mechanics' Magazine* for December 1841, a letter from our talented townsman, Mr. Robert Mallet, explaining the particulars of what he calls *his Hydro-pneumatic Buffer*, I beg leave to offer a few remarks on the subject. Having peculiar opportunities of witnessing several experiments, and having paid particular attention to his buffer while in use, I can state that the piston, or buffer bar, when forced towards one end—which could only be by violent concussion—never reacted so as to adjust itself in the position before struck at the centre. This was one great fault, and I believe the principal cause why it was so soon abandoned. Another defect was the awkward position of the buffing cylinders as regards the rail on which it was placed, as the two air vessels stood above the bottom boards, and inconveniently monopolized a portion of the space intended for the accommodation of passengers' feet. Altogether it was much too large and heavy, and offered an unnecessarily rigid and very unpleasant resistance to all ordinary shocks, such as the stopping or starting of the train. When placed alone on the railway, and struck with any heavier moving body, the buffer scarcely acted except as a rigid bar, because the power requisite to overcome the *traction* of a light coach (such as the one in which it was placed, which might be moved by a force of from ten to fourteen pounds,) was incalculably less than that required to compress such a body of air, with the additional resistance from friction of the buffer bar at each end, the two stuffing boxes, and heavy centre piston unsupported for 6 or 8 feet. The only time the buffer might be said to act from the effect of an ordinary shock, was when the cylinder was minus a portion of the water, which was constantly oozing out at the stuffing-boxes, at which time, if struck, it would sluggishly move forward till relieved, and then react through a portion of the space before traversed, but so slowly as to be scarcely perceptible —a defect which must have been owing to one of two causes, the resistance to the friction above mentioned, or the escape of water over or around the centre piston.

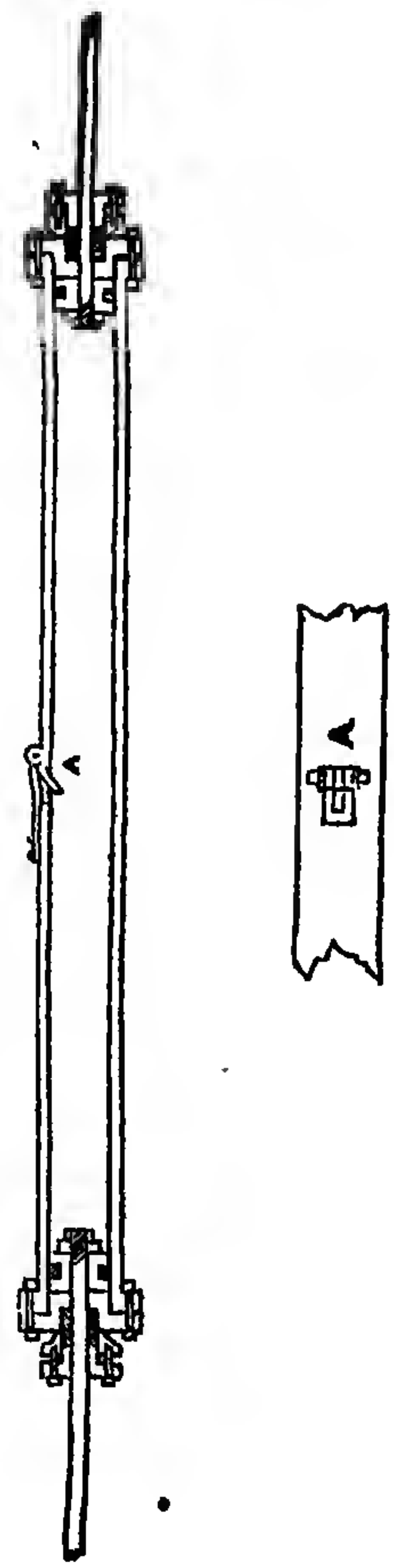
I have no doubt this buffer may be so modified as to resist the shock of a train, if fixed at the terminus of a railway; or for a heavy locomotive engine, if the attendants were very assiduous, and sufficiently philosophic, so to ascertain the exact amount of unknown quantities, as to know when the injected air would be of equal density at either end. The adoption of such a system of buffers would, however, be the means of providing employment for many persons more than are ordinarily required.

There is one paragraph at the conclusion of Mr. Mallet's letter, (page 420,) to which I shall briefly allude. Mr. M. says, "This buffer continued in use a long time upon the Dublin and Kingston railway—as long, I believe, as the under carriage lasted—and at length fell into disuse from neglect, as standing isolated in the midst of a different buffing system." The "long time in use" was, on an average, part of one day in each week, for a few months, and then only in cases of the greatest necessity, on account of the extra weight of the coach, and rigidity of the buffer; the "carriage" in which it was fixed is still in daily use, since the *Hydro-pneumatic buffer* was removed at the desire of the person who employed Mr. M. to have it made; and as to its being "in the midst of a different buffing system," it was so only in *form*, not in *system*, as it is stated in a former page to be on "the same system of thorough buffing as that invented by Mr. Bergin."

But to pass on to what Mr. Mallet considers an improvement in the application of these buffers for railway use in general, namely, the scheme of placing a buffer "in the thickness of the roof of a railway coach." Certainly this is a perfectly novel and original idea; but I fear the application of it would be practically defective, as it would be found difficult so to frame a coach-*body*, as to have the roof sufficiently strong to resist any considerable shock. Making use of the roof as a place of resistance would indeed be using a destructive lever of the first order to crush the *coach-body*, as the pillars—technically so called—have little or no other support but at the bottom, into which they are, and must in all cases be framed. I also fear Mr. M. has fallen into error respecting the point in which the centre of gravity of a railway coach is sitnate, as the wheels, axles, and bearing springs are, in all cases, at least of equal weight with the *body*, and the buffers are gene-

rally placed on the upper side of the *carriage*, which is in all cases very heavy; consequently, the line in which the centre of gravity falls must be somewhere under the centre of the buffers, in every carriage so constructed; for which reason I can state, from much experience, that in nine cases out of ten, whatever be the nature of the collision to a railway train, the coaches are never totally upset. I have known instances of the breaking of axles, but in no case did the carriage ever tumble over; and of one wheel breaking into fragments, and yet the coach remained on the other three. In conclusion I would say, that if the roof buffer be intended to be at all practically useful, it ought to be equal in size and strength to those in the under carriage, as working in conjunction with them; but as it is recommended to be smaller, and consequently weaker, and as "partial weakness is the weakness of the whole," it must, I presume, on that ground alone be objectionable.

In the year 1835, I proposed to have a piston to compress air at atmospheric pressure in a cylinder, as a simple substitute for railway coach buffers. I considered, that as the compression would be at all times momentary, there would be no escape of air of any consequence to prevent effective working, with ordinarily well-packed stuffing boxes. The person to whom I proposed this plan, immediately employed Mr. Mallet, of Dublin, to have one made, allowing him to *improve* on my suggestion; the result of which was—in order to overcome an imaginary defect—the use of water, to prevent the escape of air, as if the pressure was intended to be uniformly continuous, and not momentary, as in every case. But what I considered a decided improvement on the experimental one, and which would prevent the necessity of pumping in air or water at any time, would be the plan, of which the following sketch is a longitudinal section. This buffing cylinder is intended to be of wrought iron, or coarse brass, 6 feet in length, and about 4 inches in diameter, with two separate pistons, and an ordinary stuffing-box at each end, through which the piston rods, or buffer bars, continue beyond the ends of the carriage, to receive the buffer heads; on the top of the cylinder at the centre, is placed two small hinged valves—one within the other—the inner to open inwards at all times when at rest; the other, or rather both, to open a small portion outwards against a small stiff spring, proportioned to resist all ordinary concussions; this latter to act as a safety-valve to prevent the explosion of the cylinder, should the pistons



be forced together by any extraordinary shock, or collision: from this it must appear evident, that as at all times the approximation of the pistons towards each other would be momentary, there would be a partial, or nearly perfect vacuum between them and the stuffing boxes, which, acting in conjunction with the rarified air in the centre, and ultimately, the ingress of atmospheric pressure at the valve, would altogether, when re-

lieved from a blow, cause the pistons to collapse, and be ever ready to offer a perfectly elastic, and very appropriate resistance for railway carriages. Instead of the valves, a small hole in the centre of the cylinder may answer for ordinary use.

E. Heydn.

Dublin, February 14, 1812.

THE LITTLE WESTERN.

Sir,—In your last Number, (966,) there is a paragraph copied from the *Times*, respecting the performance of the *Little Western* steam-boat. It is there stated that "she was accompanied down the river by one of the fastest boats, viz., the *Railway*, for which she waited off Galleons, and with which she contested, head and head, to Gravesend." Now, I do not wish in any way to depreciate the powers of the *Little Western*, being, as they profess her to be, the best boat that has been turned out from the western districts; but at the same time I must say, that had the advocates for Bristol boats and machinery been more candid in their representation of facts, it would have been much more to their credit. That the two boats went *head and head* into Gravesend, I do not for one moment dispute; but they must remember, that, after the fair start off Galleons, the *Railway* kept gaining, and it was not until a stoppage at Purfleet, where the *Railway* had to land five passengers, (four ladies and one gentleman,) that the *Little Western* came up to her, and, from the well known attraction of two boats in close juxta-position, the *Railway* could not get away from her opponent before their arrival at Gravesend; so much for the *head and head* match, as it is represented.

It is much to be regretted that, in the reports of the performances of steam-boats, no mention is made of the fuel expended. Now, I have ascertained from the most authentic sources, that the fuel consumed in the *Railway* is about six hundred weight and three quarters per hour, being at the rate of about *eight pounds per horse power per hour;* while the rumoured consumption of the *Little Western* is thirty-three hundred weight, being at the rate of about *twenty-three pounds per horse power per hour.* Now, if this be true, (and if not, they can contradict it, and say what it really is,) or taking the expenditure of fuel at only *double* that of the *Railway*, surely *convenience* and *rapidity* must be very *imperative* indeed, to induce speculators to supply the public with them at such a rate. If this is all the London engineers have to compete with, their task is indeed easy.

I am, Sir, yours, &c.,

X. Y. Z., (passenger per *Railway*.)

London, Feb. 15, 1842.

MESSRS. PALMER AND PERKINS'S PATENT PUMP.

Derby, February 8, 1842.

Sir,—I have attentively perused Messrs. Palmer and Perkins's description, in No. 963, of what they are pleased to style an improvement on that "most important," but much abused article, the *common pump*. If their pump be so efficient as they allege, will you permit me to ask why they have drawn it with so short a suction-pipe? It is quite ridiculous to talk of testing the capabilities of such a machine for mining purposes with a five, or even fifteen feet lift. Again, as to their wonder-working valves — were they *simply discs* "cut diagonally out of a solid cylinder of the same diameter as the bore of the pump-barrel," there could be no doubt that, at the proper angle, they would "fit the barrel with the greatest accuracy;" but doing so, it would be impossible they should work on their spindles: and to enable them to take the position of the open clack, as shown in fig. 3 of Messrs. Palmer and Perkins's drawings, the disc must be reduced nearly $\frac{8}{16}$ths of an inch on each side, as set out in the subjoined diagram for a ten-

inch pump. A *wonderfully efficacious* method, this, of rendering them fit for retaining liquids, gases, and steam! With respect to the trial at Mr. Robinson's, it proves, in my judgment, nothing beyond the facility with which plausibly described experiments may be made to fit and (apparently) to corroborate almost any sort of foregone conclusion. He

must be a great bungler who could not as easily have shown the packed piston to be attended with double the amount of friction ascribed to it. No, no. Comparative experiments, by all means; but let them be fair experiments, conducted by, or in the presence of, competent and disinterested parties.

I am, Sir, yours respectfully,
TREBOR VALENTINE.

PILBROW'S CONDENSING CYLINDER ENGINE.

Sir,—I must again intrude upon your kindness, and solicit space enough in an early number of your Magazine to thank your valuable correspondent, "Scalpel," for the bold manner in which he has spoken of my engine. I doubted not, judging from the past, and the interesting papers which have emanated from him, but that such would be the case, whether for or against.

"Scalpel" is the first, I think, of your correspondents who has had temerity or good opinion enough to pronounce *decidedly* in favour of my invention, but I fear not that many, ere long, will join him.

It is but justice, perhaps, to myself, that I should at the same time inform "Scalpel," that his friendly suggestion of "increasing the area of the condensing cylinder" was done by me many months ago, and that the drawings in the hands of the manufacturers are made so; not that I apprehended any jar, or found that the piston, when discharging the condensement, travelled any faster than the ordinary air-pump bucket, the steam piston travelling at the usual speed; but, upon the whole, there were advantages to be gained from such an arrangement, and it lessened, sometimes, the prejudice of those I met upon the subject.

I am, Sir,
Your obliged servant,
JAMES PILBROW.

Tottenham-green, Feb. 12, 1842.

LAW OF PATENTS—DEFECTIVE SPECIFICATIONS.

Court of Queen's Bench, Westminster, Feb. 12.—(Sittings at Nisi Prius, before Lord Denman and a Special Jury.)

The Queen v. *Nickels.*

This was a *scire facias* to repeal a patent which had been taken out in respect to the braiding-machine to which the defendant had made some additions and improvements.

The *Solicitor-General, Mr. Erle,* and *Mr. Hindmarch,* appeared for the Crown; the *Attorney-General, Mr. M. D. Hill,* and *Mr. Hoggins,* for the defendants.

The *Solicitor-General,* before entering upon the merits of the invention, submitted to the Court that it would be a mere waste of time to call any witnesses, or enter into any inquiry about the circumstances of the case, as the specification upon which the patent had been founded was illegal and void. The patent was for *additions to* and *improvements in* a machine already in existence; and it was a fundamental principle of the patent law, that in such cases the specification should clearly and precisely define the part of the machinery to which the patent was applied. Without such a statement, it would be obviously impossible for the public to know what part of the machinery they were prevented from using during the period for which the patent was to run. The learned gentleman further contended, that the specification did not so describe the nature and construction of the invention itself, as that any person in the same trade could make and apply it as soon as the period for which the invention was protected by the patent should have come to a termination. As the specification was therefore illegal with respect to the two capital objects for which every such document was required by law, it became altogether unnecessary to enter into the other parts of the case.

The *Attorney-General,* on the part of the defendant, submitted that any intelligent workman connected with this particular business could see, with the help of the drawing annexed to the specification, what part of the machinery was new, and what was old; and the learned gentleman proposed to give evidence to that effect.

Lord Denman, however, was clearly of opinion that the material parts of the specification were inadequate when taken severally, and inconsistent when taken together. Such being the character of the specification, his lordship was of opinion that it would be a mere waste of the public time to hear any evidence upon the subject; and his lordship directed the jury, therefore, to return a verdict for the Crown.

The *Attorney-General* then tendered a bill of exceptions, which was received.

Court of Queen's Bench, Westminster, Feb. 14.—(Sittings at Nisi Prius, before Mr. Justice Wightman and a Special Jury.)

Cooke v. *Pearce and others.*

This was an action for the infringement of a patent which the plaintiff had taken out for an improved method of working what are called "German windows," in barouches and other carriages of that nature to which windows of that sort are applicable.

The *Attorney-General,* (with *Mr. Hoggins,*) appeared for the plaintiff, and called

witnesses, who proved that the method and machinery in question were highly useful and advantageous to the public, within the range in which it could be applied, and that the plaintiff was the first person that had so applied it.

Mr. Erle, (with *Mr. H. Hill*,) appeared for the defendants, and submitted, *first*, that the improvement in question was not the proper subject of a patent at all, as it consisted merely, or principally, in the application to the window of springs, the nature and quality of which were perfectly well known to the public for a very long period of time; *second*, that the specification did not describe with sufficient accuracy the nature of the invention, for that the old and new parts were not properly distinguished from each other; and, *third*, that in stating that the invention was applicable to carriages, the patentee claimed too much, for that it was not applicable to chariots and close carriages, and the patent having claimed more than could be supported, the patent became void on that account.

A great deal of discussion arose upon these objections, and it was ultimately agreed between all parties to put certain facts upon the record in the shape of a special verdict, upon which the judgment of the Court above is to be taken upon a future occasion.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM EDWARD NEWTON, CHANCERY-LANE, CIVIL ENGINEER, *for improvements in the manufacture of fuel.* (A communication.) Petty Bag Office, January 7, 1842.

This fuel, to which the name of "Carboleine" is given, is thus produced. A quantity of coal, charcoal, coke, brown coals, or peat coals, being reduced to a fine powder, is put into wooden tubs and mixed with oil; two and a half parts of water, to one of clay or loam, are then added, and the mass worked into cakes by hand or machinery. These cakes being afterwards gradually dried, by the application of fire-heat, become nearly as hard as stone, and in burning are said to give out more heat than any other known combustible.

Should a fuel capable of producing a still more intense heat be required, oil and fluid tar are combined with powdered coke and coals. The proportions of the ingredients for three qualities of carboleine are given as follows:—

No. 1. Twenty-four parts coal, six or seven of clay water, one of oil, and one of bitumen.

No. 2. Twenty-four parts coal, six or seven of clay-water, and two of oil.

No. 3. Forty parts of coal, thirty-six of clay-water, and four of oil.

JOSEPH RATCLIFFE, OF BIRMINGHAM, MANUFACTURER, *for certain improvements in the construction and manufacture of hinges for hanging and closing doors.* Enrolment Office, February 3, 1842.

A lever, to be screwed or otherwise attached to the under side of the door, is mounted on the square head of a vertical axis, the upper end of which is supported in the brass cover, while its lower end works in a cylindrical cavity of the cast-iron box within which the mechanism is placed. Near the lower end of the axis a segmental plane is affixed, with its upper surface inclined to an angle of about 70°. Within the box, and turning on a horizontal axis, is placed a broad lever, at the end of which there are two small rollers, disposed at such a distance asunder as to rest upon the two edges of the segmental plane; from this lever, immediately over the horizontal axis, rise two arms or levers, at right angles with the former, carrying between them a swivel nut, stepped to form abutments for two strong helical springs placed one within the other. This part of the mechanism is screwed down into the cast-iron box which forms the base of the hinge, in such a position, that the two small rollers rest one on each side of the inclined segmental plane. At the back part of the box there is a metal plate, carrying a screwed pin, upon which a stepped nut is mounted, opposite to the swivel just before described. Between these nuts two strong spiral springs are placed, the pressure of which can be adjusted by screwing backward or forward the hindmost nut, four holes being made in its circumference to admit a lever for that purpose. On opening the door to which this apparatus is applied, the inclined segmental plane is brought under one of the rollers and raises the broad lever, which pushes back the swivel nut and compresses the spiral springs; the reaction of these springs upon the inclined plane turns the axis, and closes the door.

The claim is, 1. To the general arrangement of the parts of a door-hinge, as described and illustrated; 2. The use of the swivel nut for receiving and transmitting the pressure of the springs to the levers.

JOHN LEE, OF NEWCASTLE-UPON-TYNE, MANUFACTURING CHEMIST, *for improvements in the manufacture of chlorine.* Enrolment Office, February 4, 1842.

These improvements consist in manufacturing chlorine by the use of retorts or ovens, which are so arranged as to have the heat required for the process transmitted downwards, through the covering or arch of the oven or retort. In the drawing accompanying the

specification, three retorts or ovens are shown, as heated by the fire of one furnace; each of the chambers is covered by an arch, over which the furnace flue is led, so that the heat may be transmitted downward, through the arches, to the materials placed within the chambers. In each chamber there is a trough of stone, such as is used for the condensers and flues of alkali works; or the troughs may be made of fire-clay, moulded into the required shape. One side of each chamber is furnished with a leaden door, and at the opposite side there is a pipe of lead, or earthenware, for the escape of the chlorine. The fire being kindled, and the chambers sufficiently heated, lumps of manganese are placed in the troughs, and the doors closed; muriatic acid is then introduced through glass tubes, conveniently placed for that purpose, and the chlorine is given off. The muriate of manganese is drawn off from the troughs, on the completion of the process, by means of syphons.

The claim is, 1. To the mode of manufacturing chlorine by the use of retorts or ovens, so arranged as to have the heat required for the process transmitted downward, through the covering or arch of the retort; 2. To the mode of constructing the troughs or bottoms of ovens or chambers for evolving chlorine when fire heat is used below, or at the sides, or tops, each of one piece of stone, or moulded fire-clay, as described.

John Seaward and Samuel Seaward, of the Canal Iron-works, Poplar, Engineers, *for certain improvements in steam-engines.* Enrolment Office, February 10, 1842.

The improvements comprehended under this patent are divided into four branches. The first comprehends various new modes of connecting and disconnecting the paddle-shafts of marine steam-engines. The second consists of an addition to the ordinary air-pump bucket of steam-vessels of a sort of false bottom, which, by excluding the water that now ordinarily collects at the bottom of the pump, facilitates the escape of the uncondensed vapour and gases, and thus helps to produce a more perfect vacuum. The third branch embraces several modes of discharging, at regular intervals, and in duly proportioned quantities, the brine, or saturated or foul water, from marine steam-engine boilers. And the fourth consists of a condensing and distilling apparatus, (superseding entirely the ordinary condenser,) by which the spent steam of the working cylinder is, previous to its condensation, made to assist in obtaining by distillation a constant supply of fresh water. By adopting the distilling part only of this apparatus, it may be used in connection with a condenser of the common form.

Samuel Brown, of Gravel-lane, Southwark, Engineer, *for improvements in the manufacture of metallic casks or vessels, and in tinning or zincing metal for such and other purposes.* Enrolment Office, February 11, 1842.

The improvement "in the manufacture" consists in a mode of fixing the heads and ends of metal casks and other vessels by means of tinning or soldering. The metal of which the cask is made having been previously tinned, the head is slightly forced into its place, and having been dipped into powdered rosin, is held by a suitable apparatus, and lowered into a shallow vessel containing melted tin, in which it is kept immersed for five or ten minutes. In some cases a hoop is driven on to the end of the cask, and fixed by the tinning process at the same time as the head.

The improvement "in tinning, or zincing" sheets of metal consists in the employment of a hot plate on which the coated metal is laid after tinning or zincing (which is conducted in the usual manner,) while the superfluous metal is wiped off its surface.

The claim is—1, To the mode of fixing the heads or ends of casks or other vessels, by immersing the ends of such vessels in a bath of suitable melted metal, as above described.

2. To the mode of keeping sheets of metal heated (in order to the superfluous coating metal being removed) by the application of a hot plate, as described.

William Hale, Engineer, and Edward Dell, Merchant, *both of Woolwich, for improvements in cases and magazines for gunpowder.* Enrolment Office, February 12, 1842.

These improvements consist in the construction of covered cases and magazines for gunpowder of cast or wrought tin, whereby cases containing gunpowder will not be chemically-injuriously acted on by the powder.

These cases are made six-sided, so as to possess considerable strength, and at the same time, to allow of a number of them being packed closely together. On the top there is a cylindrical neck, on which a male screw is cut or formed, blanks or spaces being cut in three equidistant parts, to admit corresponding projections on the inside female screw of the cover to enter. The cover is held to the case by a quadrant-shaped bolt or pin, which prevents its being detached when the case is opened. On the inside of the cover is placed a leather or other washer, so that on placing the cover in its place, and turning it partly round, a close joint is made. These cases may be cast in moulds of either sand or metal, or they may be made of wrought tin soldered up. By this means,

say the patentees, a covered case or magazine of any required size may be made, which, from the peculiar character of the metal, will retain gunpowder with great safety, and without the metal of which it is composed being prejudicially acted upon by the chemical properties of the gunpowder.

The patentees state that they do not confine themselves to the form, or to the mode of fixing the cover, both of which may be varied, nor do they confine themselves to the exclusive use of tin. But they consider tin, in an unalloyed state, to be best adapted for this purpose.

NOTES AND NOTICES.

Pearl Fisheries of Ceylon.—The principal pearl fishery in Ceylon is that off Aripo, where the oysters lie in from five and a half to seven fathoms water, protected on the west and south-west by a ridge of sand and coral; this ridge is considered by the natives to be a submerged island, but it is generally believed to be a rising bank of coral and sand. The age of the oyster, at its separation from the rock, is stated by an intelligent diver to be six years and a half; the pearls are found in all parts of the fish; as many as sixty-seven have been found in one oyster; they are not generally found in those oysters that would be considered the finest for eating, which favours the idea that pearls are produced by disease in the fish. A single diver will generally bring up in a day from 1000 to 4000 oysters; the fishing takes place in March.

Gold-Dust.—The St. Petersburgh papers state that an important discovery has been made by the expedition sent in search of deposits of sand containing gold. It consists of a bed of sand, near the source of the Nadejoni, not far from the washing station called Pesaskoi Tersinski; it is estimated to contain 100,000 lbs. of sand, and, to produce 3 pouds 9 punds 16 zols of gold. In the essays already made 4 punds 60 zols of metal, rich in quality have been extracted. The poud is rather more than 40lbs. English.

Progress of Rust.—M. Montgolfier, jun., having learned that a grating of iron wire from the church of St. Martin's, at Paris, was about being taken down, after having remained forty years without any repair, had the curiosity to prove these wires, after having carefully ascertained their number, and he was convinced that they had lost but one fifth of their entire strength. The increase of oxidation is not as rapid as might be supposed, for the first layer of rust which covers the surface of a bar of iron, instead of favouring this oxidation, proves a coating which is an obstacle to it.

Steam Navigation of the Indus.—A correspondent, on whom we can rely, has favoured us with some interesting information as to the navigation of the Indus, and the British craft now on it. Sir Alexander Burnes had thought that a vessel of four feet water might always ascend it in safety; but it is found, by experience, that one drawing more than three feet water is useless, from the perpetual shifting of the river's bed and channel, and the peculiar formation of its bars. Vessels of that draught have ascended to Loodieana on the Sutledge, and could reach Kalabagh on the Attock branch; the Rava branch is navigable to Lahore; and the Cheenab is believed to be navigable to a considerable distance from its junction with the main stream near Moultaun. There are at present only three steam-vessels, all of iron, on the Indus—the Comet, Planet, and Satellite; the first of forty-horse, the others of sixty-horse power. They draw thirty-six inches of water. A smaller vessel, the Meteor, is under repair at Bombay. Two of the Euphrates steamers, of fifty and forty-horse power, have been ordered to Bombay, most probably for the Indus. The communication between Bombay and Kunetchee is kept open by the Indus steamer; but it draws too much water for the river.—*Spectator.*

India-rubber Welted Hose.—The making of this description of hose is rapidly extending in France; from some astonishing cause, the few attempts made in Nottingham have not succeeded. We believe the causes are—first, that the English web is deficient in the number of warp-threads; secondly, that the web is stretched too far on the needles; thirdly, that the weavers do not turn the welt down over the stocking, which increases the comfort to the wearer; and, lastly, that the hose and half-hose are not made that extra length to allow for such turning down. We speak for ourselves when we say that, having worn stockings with India-rubber welts, nothing can excel their comfort, as they act as an elastic garter, without the trouble of buckling and unbuckling, and wholly prevent that most unpleasant circumstance—the stockings coming down about the heels of the wearer. The India-rubber will wash, but it is rather injured by long boiling. Always anxious for the good of the English hosier, we advise them that French India-rubber welted hose have made their appearance in London; we saw large quantities in Paris, in September last.—*Nottingham Journal.*

Sheathing Steam-boilers with Lead.—A correspondent of the Mining Journal states that, at a manufactory in Newcastle-on-Tyne, the boilers have been cased with sheet-lead, one-eighteenth of an inch in thickness, and weighing four pounds to the foot; and that the amount of the radiated heat is thus so much diminished, as to be equal to a saving of 17 per cent. in fuel. "The average consumption of coal, by these boilers, previous to the adoption of this plan, was 60 cwt. per day, but now 50 cwt. is found to be amply sufficient; therefore a positive advantage is obtained of 10 cwt. per day, which is one-sixth, or 17 per cent."

Iron Wire Rigging.—A vessel, "the *Marshall of Grimsby*," is now in the river off Hermitage Stairs, the rigging of which is all of wire, (Smith's patent wire rope). It has been nearly six years thus fitted up, and the rigging is stated to be nearly as good as new.—Taking a 3-inch wire rope, and comparing its size, weight, and cost with hempen rope, or chain, of equal strength, the results are found to be—

A 3-inch patent wire rope, weight $6\frac{3}{4}$ lbs. per fathom; hemp rope, of 8 inches, $14\frac{1}{2}$ lbs.; and $\frac{1}{1}\frac{3}{6}$ chain, 36 lbs.—equal to a strain of 16 tons. The comparative cost being—3 inch wire rope, 3s. 8d. per fathom; 8 inch hempen rope, 6s. 3d.; and $\frac{1}{1}\frac{3}{6}$ chain, 7s. 6d. per fathom.

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THE HADDINGTON MARINE STEAM-ENGINE.

Fig. 1.

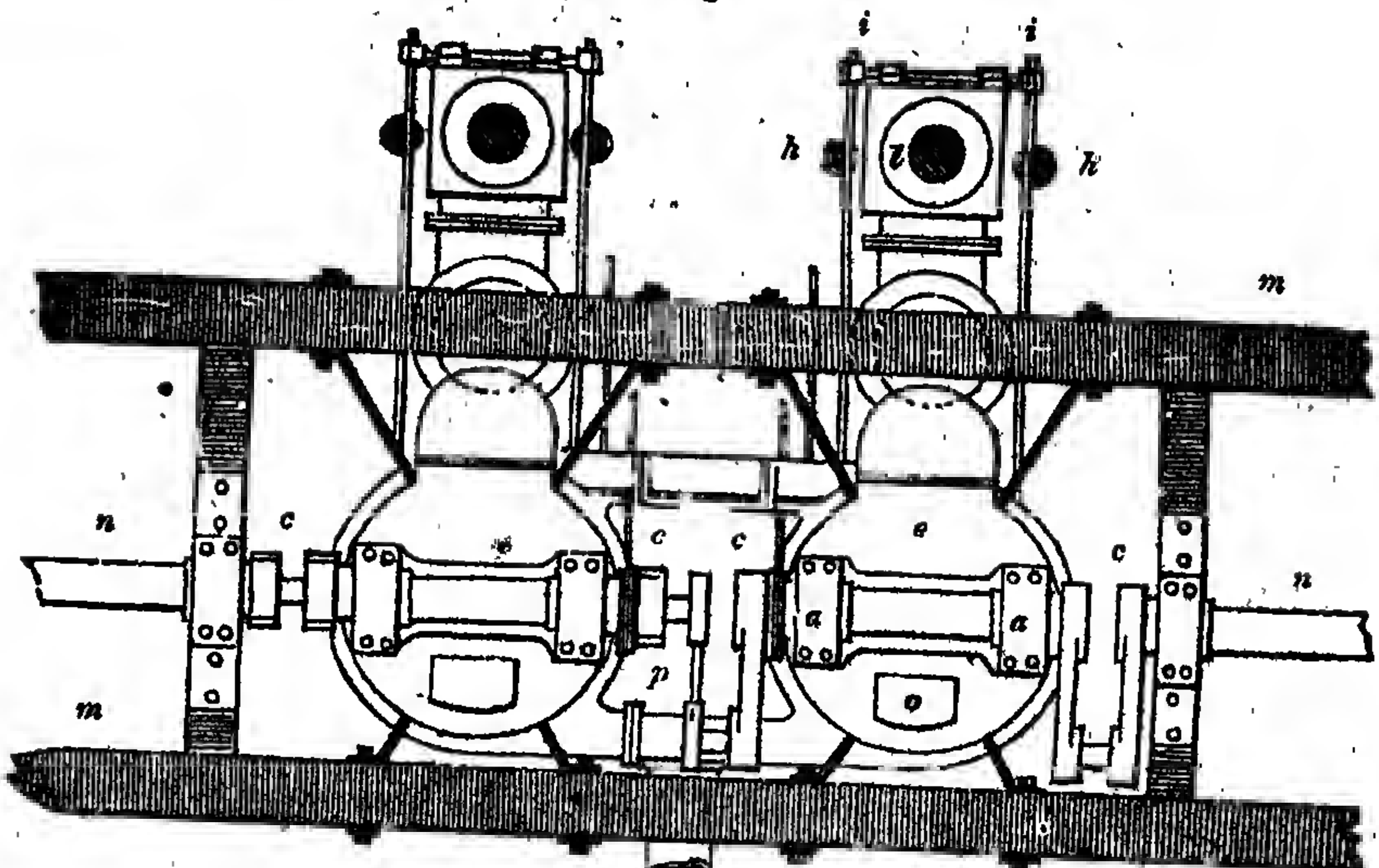
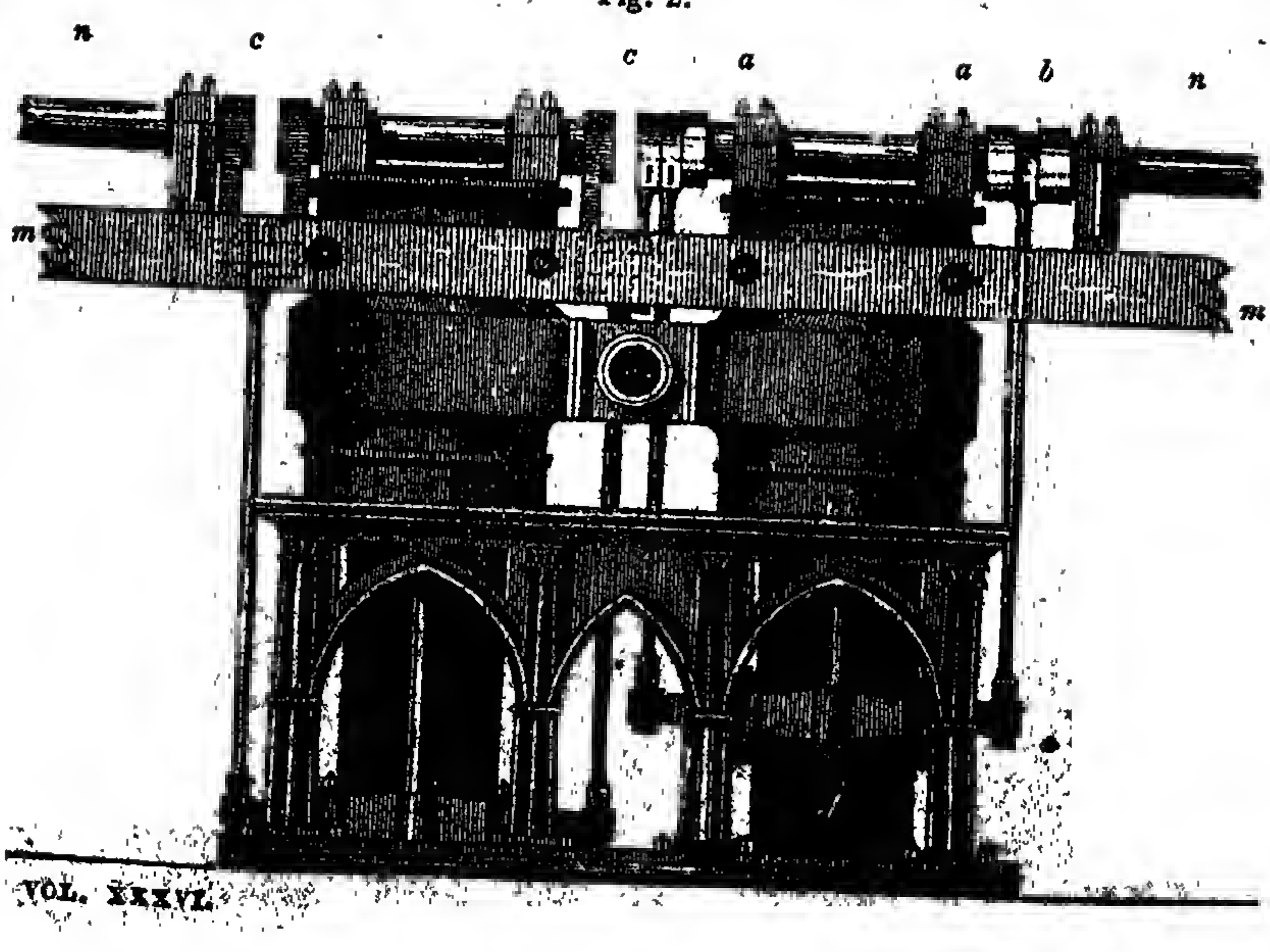


Fig. 2.



DESCRIPTION OF THE HADDINGTON MARINE STEAM-ENGINE. BY THE INVENTOR.

The marine steam-engine about to be described was modelled for the first time at the request of Mr. George Rennie, and examined by Mr. Lloyd, at Woolwich, by order of the Admiralty, in May, 1841. At that time, the method of connecting two engines on the principle shown by the model was not explained, and Mr. Lloyd considered an intermediate shaft would be necessary, with a greater length of hatchway across the deck of the vessel than he approved of, or than was, perhaps, convenient. Since then, however, I have devised connecting the engines by a single *link*, which is simple, and, from its accommodating nature, well suited to marine engines having foundations, at best deficient of rigidity. This mode of connection is shown by the accompanying drawings, and its action was clearly defined by a second model that was submitted to the notice of the Admiralty.

Mr. Lloyd also objected to the apparent inconvenience there might be in keeping the packing tight round the piston-rod, from the stuffing-box being below the cylinder, and the screws which compress the packing less accessible than when placed above the cylinder in the ordinary way. This defect has also been removed by substituting a weight and lever for the screws, making, in fact, the stuffing-box self-adjusting, and thereby avoiding the trouble of screwing it up. The piston-rod is lubricated from an external chamber by an induction-pipe, and the same method is used to lubricate the piston-rod of the slide-valve.

By my arrangement for marine engines, the crank-shaft is placed upon the top of the cylinder, which is inverted, and requires to be removed when the cylinder cover is taken off. To some individuals this has appeared a serious matter; with me it has little or no weight. Having placed a man-hole in the cover, the trouble of removing either the cover or crank-shaft will be avoided, unless the piston or piston-rod should want a thorough repair. By the present mode of managing marine engines, there is no such convenience, and the cylinder cover is always removed when the engineer thinks it necessary to have a peep at the inside.

When Mr. Lloyd inspected the model that was made at Messrs. Rennie's, he informed me it would be considered with reference to the most improved engines in Her Majesty's service, namely, the *Gorgon* engines, and those of Messrs. Maudslay and Field's invention, and not the old engines with side levers. As respects Messrs. Maudslay and Field's engines, the comparison would be quite fair; they have the advantage of a long stroke and long connecting-rod, and are contained in much less space than engines having side levers, which are the very advantages aimed at in my design; whereas, in the *Gorgon* engines, neither the one nor the other is considered.

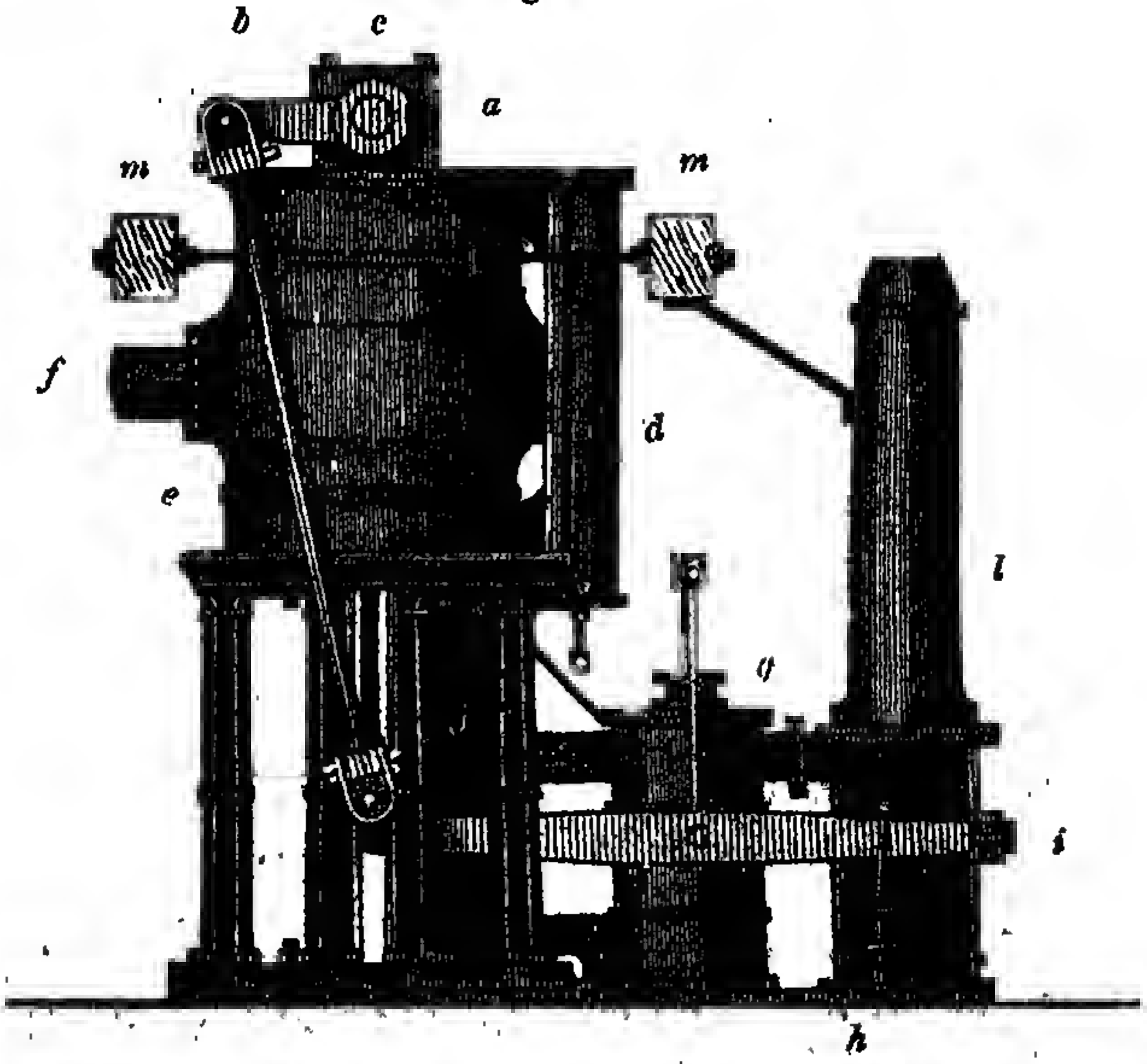
In effecting this improvement, Messrs. Maudslay and Field have been compelled to divide the cylinder into two parts; and by placing one of them a little distance from the other, space is afforded for the connecting-rod to vibrate between them, by means of a T-formed cross head. The top connects the piston-rods of the separated halves, (as a matter of course,) formed into cylinders, and the leg drops between them, and gives motion to the connecting-rod from a joint at the end. The plan is highly ingenious, but whether separated pistons, working in separated cylinders, connected by a cross head of the above form, is not more liable to derangement than the single cylinder, in the position I have placed it, remains to be proved. What the space which Messrs. Maudslay and Field's engines occupy, and their cost, may be, in comparison with mine, there is nothing to show, but I think the advantage would be on my side.

From the arrangement of a *Gorgon* engine, as it is termed, the stroke of the engine and connecting-rod is unavoidably short. The stroke of every engine being double the length of the lever or crank which it turns, it follows that the paddle-wheels of these engines must be driven by a *reduced leverage power*. To make good this defect, the cylinder of the engine is enlarged, and the velocity of the piston is impeded, to economise the steam. To obtain adequate results from such an arrangement, the force of the steam power must be increased in proportion to the diminished length of the crank: this is easily effected, but its evil consequences are, perhaps, not so easily avoided.

If two engines were placed in the same

vessel, but not connected, so that each might drive its own paddle-wheel, and one of them were 100 horses power, with a 6-feet stroke, and the piston travelling at the rate of 200 feet per minute, while the other had a stroke of 4 feet, with the piston travelling at the rate of 133 feet per minute, the latter must exert a force on the crank-pin equal to that of 150 horses power engine to be a match for the former. Both paddle-wheels would then make the same number of revolutions; but the immense difference between the forces employed to effect this adds greatly to the strain on the crank-pin of the short-stroked engine, and to the friction on the brasses of the connecting-rod, and the bearings of the crank shaft. The circumstance of impeding the velocity of the piston only serves to economise the steam, but in no respect lessens the strain on any of the moving parts of the engine which are employed in conveying the motive power to the crank shaft. Neither can it lessen the strain on the framing of the engine, or ship, but substitutes, as it were, an engine of 150 horses power to perform the labour which can be done by another of 100 horses power, the piston of the former travelling at the rate of 133 feet per minute, and that of the latter at 200 feet.

Fig. 3.



The usual way to determine what should be the length of a connecting-rod of an engine, is by the length of the crank it turns. With land engines it is generally made six times the length of the crank; in the case of marine engines with side levers, somewhat less than five; and with the short-stroked Gorgon engines, only three. A connecting-rod only three times the length of the crank lies in a very oblique direction when the crank is in the position of communicating its greatest power to turn the paddle-wheels; consequently, acting with more friction and less effect at that important portion of the crank's revolution when the paddle-wheels feel the force that propels them in the highest degree. As the crank moves round from its extreme leverage, the length of the connecting-rod may be said to be virtually increasing, but the proportion of 3 to 1, in my opinion is much too short when the crank is at right angles to the piston-rod, and in the position described as respects its effect on the paddle-wheels. From this view of the subject two evils are combined in the arrangement of the Gorgon engines. One is, the introduction of a much greater mechanical force to propel the paddle-wheels than is necessary; and the other, losing the full advantage of the crank's

leverage when at the greatest. The former is consequent on a short stroke, and the latter, on a short connecting-rod. In carrying out the principle to an extreme, either jointly or separately, the same result takes place, namely, a total destruction of the whole mechanical energy by friction. On the other hand, let the long stroke and long connecting-rod be extended to the utmost limits of man's capability, and we shall still have an engine that will work effectually, although the proportions be in an inverted form.

Having ventured to give an opinion on the principle which has for its basis the application of a short leverage with an increase of power to the purpose of driving paddle-wheels, I shall now proceed with a description of the accompanying drawings of the Haddington Engines, differently framed since they were presented to the notice of the Lords Commissioners of the Admiralty.

Fig. 1 is a plan; fig. 2, an end elevation, showing two engines connected by a single link; and fig. 3, a side elevation of one of them. *a*, plumber-block of crank-shaft; *b*, top of connecting-rod and crank pin; *c*, crank; *d*, valve-case of cylinder; *e*, cylinder; *f*, steam-pipe; *g*, air-pump; *h*, force-pump; *i*, levers for driving pumps, worked by the cross-head of the engine; *j*, condenser; and *l*, hot-well. *m*, *m*, strong wood framing athwart the ship for supporting the plumber-blocks of paddle-shafts, (see figs. 1 and 2) and *n*, *n*, paddle-shafts. From this frame strong iron stays are extended to the cylinders; and in fig. 3, one is shown extended to the hot-well; *l*, *o*, man-hole to cylinder; and *p*, the connecting link alluded to in the former part of this communication.

By this arrangement, the space occupied by the engine is reduced 46 per cent. in comparison with engines having side levers on the old plan, and the difference affords room for stowing about 100 tons of more coals in a vessel requiring engines of 200 horses power, and, as a matter of course, with vessels requiring engines of greater power, a similar advantage will be obtained. It might still be greater were the condenser, air-pump, and hot-well brought closer together, but the engine-room already is reduced to 17 feet 6 inches long, by 16 feet 10 inches wide, and it must not be forgotten that the cylinders will throw off an equal quantity of radiating heat, and too much contraction would make the engine-room unhealthy.

If fig. 3, be turned upside down and the cylinder of the engine supposed to be fixed upon the floor of the vessel in the ordinary way, then by the plan before us, the connecting-rods *b*, at the same stage of construction as respects the moving parts, effect a rotary motion on the crank-shaft, which, with engines on the old plan, have only arrived at the length of vibrating the ends of two immense cast-iron lever beams; and these beams communicate the power to a third connecting rod, nearly as heavy as the other two; which, in its turn conveys the force to the crank shaft. By this comparison, the simplicity of the Haddington engines is made to appear most distinctly. Again, if the connecting rods *b*, be turned the reverse way, and the crank shaft supposed to be elevated a proper height to be driven by them, then the arrangement would be similar to that of a Gorgon engine, and the crank shaft 7 feet 6 inches higher than what it is; but this not being admissible in a steam vessel, the alternative heretofore explained has been adopted.

The connecting link *p*, offers an advantage to a steam frigate distinct from its accommodating nature as a mode of connection between two engines. For example, previous to an engagement, it may be removed in the short space of ten minutes; the paddle wheels would then be driven by their respective engines, and by giving the rudder of the ship power to act on the throttle-valves of the engines, the velocity of either paddle might be impeded to suit the movement of the vessel, which would give great facility in bringing her about. This, perhaps might be carrying the improvement too far, and the purpose might be answered equally well by the throttle-valves being operated on by hand from the deck. There can be no question about my engines working separately, as well as jointly, and by the plan suggested being adopted on such occasions, the danger of the one engine breaking down the other, in the event of a shot disabling either, would be avoided.

JAMES WHITE.

11, East-place, Lambeth, and Haddington, N.B. February, 1842.

A VIEW OF THE COMPARATIVE MERITS AND DEMERITS OF THE THREE DIFFERENT PLANS FOR THE PROPELLING OF STEAM-VESSELS, VIZ, PADDLE-WHEELS, THE ARCHIMEDEAN SCREW, AND A NEWLY-DISCOVERED PROPELLER.*

1. *Paddle-wheels.*

The *Great Western* steam-ship, of Bristol, has paddle-wheels of 28 feet diameter, making fifteen revolutions per minute, the same speed as the engines which make fifteen strokes per minute; so that this action will give a motion to the wheels of just 15 miles per hour, assisted by the wind and sails, or about 13½ miles per hour without such assistance. The speed of the wheels, therefore, may be stated at just double that of the vessel, reckoned exclusively for that power belonging to the steam only, the average rate of speed across the Atlantic being about 9 miles per hour, inclusive of the wind and sails, and about 7½ miles per hour exclusive thereof, although both together may be reckoned at 9 miles. Now, as the voyage to America is commonly made in about fourteen days, we have the following results:—

14 days = 336 hours,
and at the 9 miles per hour as an [average of speed,
3,024 miles

(assuming, of course, that the length of distance will admit of this estimation.) The engine power belonging to the vessel is about 500 horses power, with 7 feet length of stroke in the cylinder, and 15 strokes per minute, answering to the speed of the paddle-wheels. One revolution of the wheels will be 14 feet, and the engine motion being 15 times, as stated above, this gives a motion of 210 feet per minute, or 3½ feet per second, for the piston travelling in the cylinder. Mr. Brunel says that this is, in fact, the actual rate of propulsion of the *Great Western*, and she is regarded as the most favoured paddle-wheel steamer that ever traversed the ocean.

2. *The Screw.*

The *Archimedes* vessel is furnished with a screw for its propeller, the dimensions of which are 5 ft. 9 in. diameter, and 8 feet horizontal length, having a motion given to it of 140 revolutions per minute, by 26 strokes of the engines. Assisted by the wind and sails, this power will only give a propulsive effect on the vessel of about 10 miles per hour, derived from the motion given to the screw of about 28 miles per hour, which shows a propulsion of about ⅓, attended with a loss of about ⅔ of that original motion. But taking off all the accelerated motion, both by machinery and the wind and sails, will, it is supposed, reduce the speed of 10 miles per hour down to 6 or 6½ miles per hour, as that derived from the exclusive natural effect of the screw at the original speed of the engines of 26 strokes per minute.

Hence, the merits of the screw, on a comparison with paddle-wheels, stand at a much lower estimate, the screw losing ⅔ of the original motion, whilst paddle-wheels only lose ½ of their motion.

The *Mechanics' Magazine* states several defects belonging to the screw, that will always be an impediment to its competing with paddle-wheels, whether as regards utility, speed, power, or economy. The principal are—

1. The monstrous friction, caused by the enormous speed of the screw.
2. Complexity of gear-work, rendered necessary for the high velocity.
3. The unfavourable action of the blade at the centre of motion, where it becomes parallel to the line of the ship.

3. *The New Propeller.*

Some time ago, a very limited, yet highly satisfactory experiment was made with this new propeller, at the West India Docks, in 24 feet depth of still water,—that piece of water having been selected as the most proper for making the trial in the fullest and fairest manner. The object was to ascertain the respective and comparative merits of the Archimedean screw propeller, as fixed to the *Archimedes* steam-vessel, and those of the new propeller.

The motive power was obtained from a weight, permitted to descend through this 24 feet of still water, and propelling a model of each sort of propeller. The new propeller, made to a scale of 5 ft. 9 in. diameter, and only 4 ft. length, (just half that of the screw,) was by this weight propelled 12 feet distance in 15 seconds of time, whilst the screw could only propel 8 feet distance. Here was an advan-

* The inventor of which may be communicated with by letter addressed to L., care of the publisher of the *Mechanics' Magazine.*

tage of half more space or speed in the same time.

But with the propeller made into 8 feet length, (instead of the 4 feet,) the additional engine power then wanted and required to convert the 10 miles into 15 miles per hour will constitute all the difference for that purpose; that is to say, the increased length of the propeller, by making it double, will give it double power and half more speed in the same time, as the propeller remains at the same speed of 12 miles per hour, as applied when of the 4 feet length.

A steam-vessel with this propeller will not, in short, require more, (if so much,) than about one-half engine power; the cost of fitting-up will therefore be proportionally less; it will be worked, also, at permanently less expense, causing a considerable saving in the yearly expenditure of fuel and labour.

Steam-vessels may therefore no longer be reproached as being only lumber vessels, for by this improvement they will become vessels of great capacity for cargo.

It is presumed that they will be also much more manageable than when encumbered with paddle-wheels.

Finally, it will he quite easy, as far as any thing like a judgment may he formed from the preceding experiments and data, to get up the speed to 20 miles per hour, and in some cases without requiring any machinery more than the engine motion simply applied in the most direct manner.

Comparative View of Engine Power applied to the three several plans for the propelling of vessels.

	Engine Motion.	Propeller Motion.	Propulsion to the Vessel.
New Propeller	3½ feet per second	12 miles per hour	10 miles per hour, or 15 miles per hour, or 20 miles per hour.
Paddle-wheels	3½ feet per second	15 miles per hour with wind and	9 miles per hour with wind and sails, or 7½ miles per hour without wind and sails.
Screw	2½ feet per second	28 miles per hour with wind and sails.	only 10 miles per hour, with every assistance.

L.

MECHANICAL CHIMNEY SWEEPING.

Sir,—I was sorry to find in your last Number (page 135) so disingenuous a reply from Mr. Emslie, who adheres to his own opinion with a pertinacity and inattention to facts, by no means creditable to his view of the question.

I would beg to assure Mr. Emslie, that my mind IS "left open for the unprejudiced consideration" of every plan that may be brought forward for the purpose of cleansing chimneys by mechanical means, whether it be the introduction of a principle entirely new, or—as in Mr. Emslie's case—the revival of an obsolete plan.

The question is one in practical domestic science in which I have felt considerable interest, and to which I have given some attention; at the same time, in reply to Mr. Emslie's insinuation, I beg to state, that the question is one in which, personally, I am altogether disinterested. I am by no means prepared to say that Glass's is a *perfect* machine for the purpose, yet it is generally held to be decidedly the best hitherto produced.* From a practical knowledge of what has been done, and also of what is now doing in this matter, I might stand upon my own opinion, yet in this case I am not left to do so. The vast superiority of Glass's machine has been established by many years' experience, to the satisfaction of the legislature, as well as of those gentlemen, who, from motives of the purest humanity undertook the emancipation of the "climbing-boys," and the introduction of the *very best machine* that could be found, without regard to any particular plans or individuals.

Like the master chimney-sweeps before

* I say *hitherto*, because I am aware that a plan has recently been patented which professes to accomplish that to which Glass's machine cannot pretend, viz., to sweep chimneys having any number of right-angled turnings, without requiring the provision of any soot-doors.

the House of Lords, Mr. Emslie has fabricated a drawing of such a chimney as the world never saw before—and to establish what? The superiority of the *rope, weighted brush, and pulley* system!

Mr. Emslie is peculiarly unfortunate in his "illustration," for he proves too much and thereby refutes his own argument. He admits (most truly) that the very *outré* chimney which he has sketched (and which never existed but on paper) *cannot* be swept by the rope and weighted brush alone, but requires in addition, *a long-handled scraper!* I shall not join issue with Mr. Emslie with respect to the comparative merits of *brushes* v. *scrapers;* both are excellent in their way; but as to the simplicity, efficiency, economy, and universality of application of the two systems—that is, of the "flexible rod," and the now justly exploded "weighted-brush system," there can scarcely be a doubt in the mind of any impartial person as to which "has it."

In reply to Mr. Emslie's question—"Can a single flue be pointed out, which Glass's Machine is capable of cleansing, that the *weighted-brush* mode is not equally able to effect?"—I reply, yes; a very great number. All flues having long horizontal passages, require a *long-handled* apparatus of some kind or other to effect the cleansing of the horizontal parts; the flexible jointed rods of Mr. Glass are better adapted for this purpose than any thing else—whether they be equipped with a brush or a scraper. The *weighted brush* alone cannot, under any circumstances, cleanse the horizontal parts of chimneys, but must have a Glass's machine, (or something equivalent,) to act in conjunction with it; Glass's machine, then, may as well do the whole, and the weighted brush go to—

"the tomb of all the Capulets."

The idea of having two distinct machines to perform an operation which one of them—the essential one—is capable of performing alone, is preposterous.

I will not trouble you to engrave any sketches of the kind of chimneys referred to, as your readers will find them ready to their hands in Mr. Stevens's little pamphlet.*

Mr. M'Gillivray's suggestion for improving the rope and pulley system is very good, but not good enough at this time to resuscitate that primitive, and now obsolete plan of chimney-sweeping; Glass's machine will, (as he states,) "be found by far the most economical."

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Feb. 20, 1842.

* Plain Hints on the Subject of Chimney-sweeping. To be had *gratis* at the Hand-in-Hand Insurance-office, Bridge-street, London.

IMPROVED MODIFICATION OF A NEW ELECTROTYPE PROCESS.

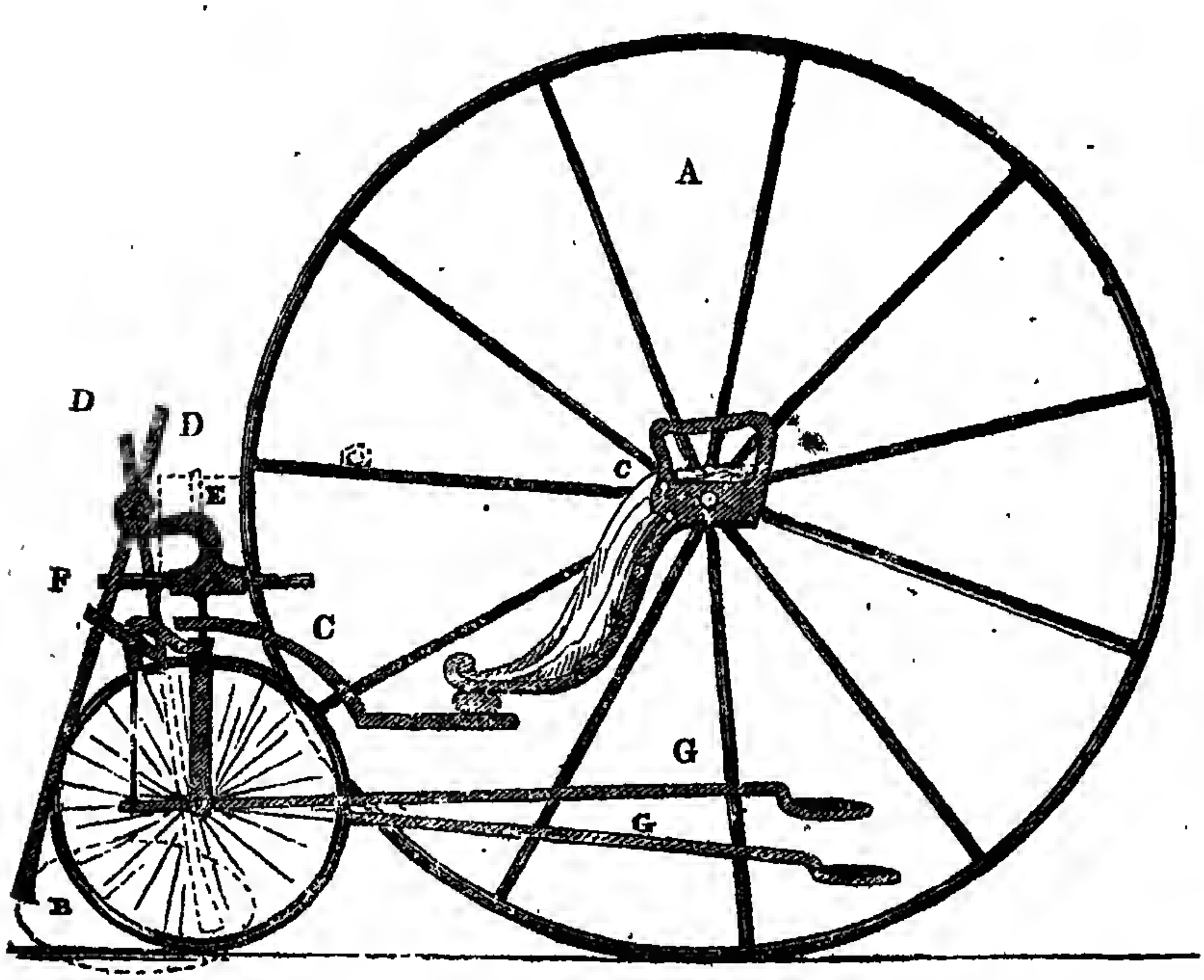
Sir,—A discovery has been recently made of etching copper plates, by first gilding them by the electrotype, and then delineating the drawing through the coat of gold to the copper. I tried the gilding process several times, but could not succeed in producing a firm coat of metal; and I am acquainted with many scientific gentlemen who arrived at the same result, namely, a dirty black powder easily rubbed off, instead of the "*glittering metallic surface of incomparable beauty*" as it has been designated by some. Indeed I am half inclined to doubt that such a thing has ever been accomplished. My trials with the "noble" metals, proving in every case a decided failure, I thought of trying what could be done by means of the cupreous deposit, as I always found it perfectly pure and firm, provided only, care were taken in conducting the process. My first experiment proved quite successful; the subject of it was an ordinary steel plate: I covered it with a thin film of copper, which I afterwards etched, and bit up with dilute sulphuric acid. Far finer and closer lines can be formed on this ground than on that in general use at present, which arises from the latter being required to be laid comparatively thicker on, which, together with its property of adhering to the point of the tool during the process, sometimes sends a whole body of fine line-work into a broken unmeaning mass. What I consider the greatest advantage attending working on a metallic "ground," is, that after the effect, &c. is bit in, the plate can again undergo the same process, if the resulting etching be not satisfactory—an object not to be attained by the employment of grounds of a waxy or resinous nature. Such grounds always require to be totally removed before the picture can be pronounced

perfect—at least, as regards the etching; and if the same be found, on inspection, to be not of the requisite degree of colour or depth of tone, the touching up is attended with much labour and uncertainty. A plate furnished with a metallic ground, can, however, be bit deeper, even *after* a proof has been printed from it; the coat of metal, of course, being allowed to remain on the plate.

Sir, I am yours respectfully,

M. Newsam.

DESIGN FOR A VELOCIPEDE.



Sir,—Expecting to be engaged in a situation, about three months ago, where there would necessarily be a great deal of travelling, and the income hardly sufficient to cover the expense of keeping a horse, over and above other expenditures, I applied myself to devise some method whereby I might travel with more ease and facility, than I could possibly do without some combination of art with nature. The following is the result of my cogitations, which I shall feel obliged by your submitting to your numerous readers, in order that any deficiency in the principle may be pointed out, for the benefit of mankind generally, and your *humble servant* in particular, as I intend to fit up such a machine, with the expectation of its being really useful,

A is one of two large light wheels, 8 feet in diameter, (which is the largest size, according to Professor Babbage, that can be rendered useful for such purposes;) B is a guide-wheel, about 3 feet; C C is the body, or fixed frame of the carriage, made of wrought iron, and as light as possible: there may either be a seat for two persons, and a packing box or boot underneath; or, if designed for one traveller alone, it may merely be a platform case covered with loose oil-cloth, to carry his food or any small article in. D D are the propellers, worked by the opposite cranks F, (on the same shaft,) and sliding freely up and down in self-adjusting guide-sockets, hung each on its own axis in the moveable frame E, which, when placed in the

position most approved in practice, is held there by the screw at the lower part of said frame. G G are the treadles which work the cranks. The wheel B, with the crank propellers and adjusting frame, are all fixed in a straightforward direction on the spindle, which works freely in and passes through part of the frame C; consequently, the guiding is effected by a kind of side pressure, similar in effect to that of a person pushing a boat, when his hands are applied to some external object, as an abutment.*

A few advantages expected to be derived from this arrangement, over any I have yet seen, I shall endeavour to point out; and any fallacy which may appear, or any improvement which may suggest itself to any of your ingenious readers, I shall feel pleasure in its being pointed out. I anticipate, when the speed is once attained, (which, on a good hard Macadamised road, will be readily done,) it can be easily kept up by *one* complete stroke of the treadles to about four revolutions of the large wheels, which, being 24 feet in circumference, makes a clear distance of 32 yards, or about 7 smart strokes for every 200 yards! The operator continually rests on his right foot, which clears the propellers of the ground, and allows the guide-wheel to run freely:† there ought to be a stout spring, or counterpoise by "dead weight," for the purpose of carrying the crank over the upper centre, as connected with the right foot, for as he rests on that foot, it will need a help to start it. The cranks ought to be so adjusted with respect to each other, that just as the propeller is touching the ground, the mans's greatest force is operating on the crank (*i. e.* when it is at right angles with the treadles;) then the point of the propeller describes an elliptic, which will strike the ground more or less, according to the position of the sliding frame B, which lifts the wheel and fore-part of the vehicle off the ground, and drags the hinder part after it. Of course, the guide-wheel has already acquired a certain degree of motion, and therefore there is no check when it again reaches the ground.

With regard to the two machines described by Mr. Baddeley, I beg leave to state that I saw them tried, fifteen years ago, in this town, by some good workmen, of the name of "Kilburn," and either way, (*i. e.* by using a handle or treadles to the cranks of the large wheels,) they were such hard work that they were speedily laid aside. Another great benefit I anticipate from my arrangement is, that the hind wheels being disconnected, will make the machine turn with more facility, as the inner wheel can stand comparatively still, while the outer one works right round it.

I beg also to recommend the following modification of the above arrangement for steam-carriages on common roads, whereby the engines may be made of much less power, considerably lighter, and more effective. I am aware that Mr. Gurney and others have used propellers, but theirs have been placed, invariably, underneath the *whole weight* of the carriage and engine, thus constraining it to lift the whole of that weight in the circular part of the stroke. Now, I would propose that the engine, carriage, and load, should be all pretty nearly balanced on two wheels, (moving freely and independent of each other, as in an ordinary carriage;) further, that the preponderance ought to lean on the third, or guide-wheel. The arrangement may be also such, as that the engine shall be always working slowly, only accumulating power at one part, and throwing it out briskly at that part of the stroke where it is most effective. The two propellers might, perhaps, be more efficiently placed by using *two* guide-frames, one a little in advance of the other, so that when one propeller had lifted the fore-part of the carriage, and dragged it forward, the other one—its guide being more in advance—would give the whole a smart push, and so keep up or increase the velocity required.

In all the machines of this kind I have yet seen described, the traveller had harder to work, the quicker his pace; in this machine it is the reverse.

I remain, Sir,

Yours respectfully,

WM. PEARSON.

Bishop Auckland.

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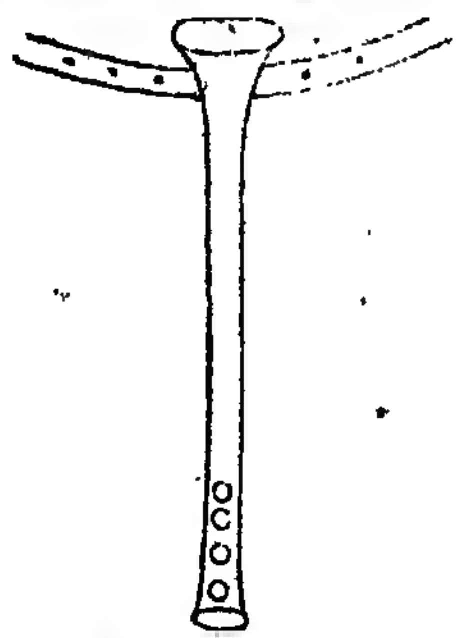
* I had almost forgot to remark, that there ought to be a circular spring "brake," on which the operator might lay his right hand, and stop the carriage instantly, without any strain on the machine.

† The dotted lines on slide will show how I mean: when the traveller eases up his foot, the weight having power on the propeller the crank begins to act.

REMEDY FOR SPONTANEOUS COMBUSTION OF COALS—ARMAMENT OF H. M. STEAM FRIGATE "GEYSER."

Captain Carpenter, of Her Majesty's steam frigate *Geyser*, has suggested the following remedy for spontaneous combustion.

It is proposed to have several cast-iron tubes, with holes at the lower part, as shown in the following figure, passing into the bunker or coal-hole, nearly to the bottom



of the vessel, and only a few inches from the ship's side, properly secured. The upper parts of these tubes are to come up to the deck, and to be contrived so as to give ventilation without allowing wet to go down amongst the coals. At the same time, means are to be afforded of pouring water into the bunkers, so as to flood them at the bottom in case of ignition. The water, in that case, would have a twofold effect, as it would not only extinguish the fire at the place where danger is to be apprehended, but at the same time the water poured into the tubes would destroy all ventilation, and would have a tendency to smother the part ignited.

The cause of spontaneous combustion is, evidently, first, the accumulation of gases from the moisture of the coals; and then, either heat or friction gives rise to ignition. To obviate this evil, if you allow the atmospheric air to pass freely amongst the coals, of course the gases could not accumulate, and combustion would not take place. If, however, there should be parts where the air did not penetrate, then the remedy is effected by pouring water into the bottom of the coal-box, and extinguishing the fire. The smoke issuing from the tube on deck would always give timely notice of danger; and the hose on deck, pointed into the upper part of the tube, would provide a sufficient supply of water always at hand. The tubes would be about six inches in diameter, and about a quarter of an inch thick; their length would be regulated by the depth of the coal-box.

Hay-stacks are provided with the same remedy against taking fire, by introducing a large basket tube down the centre; and why should not the same result take place in the manner proposed?

The *Geyser* is to be fitted, under Captain Carpenter's able direction, with several things which are likely to give rise to improvements in naval warfare. In the first place, she is to have two guns weighing 114 cwt. each, to carry solid shot and shell. The range of these guns will be five thousand yards, and they will carry further than any gun that has yet been cast, by 400 yards. This vessel will, consequently, have it in her power to disable the largest ship in the world, and at the same time to keep out of harm's way.

The pinnace of the *Geyser* will be fitted with a small disc engine, and Captain Carpenter's patent propellers.* This boat will be used occasionally as a tug, to assist ships in calms; or, should the machinery of the *Geyser* be injured by shot in action, this boat could tow her out of danger. The boat could also be used with advantage in towing boats filled with troops, especially such boats as those fitted over the paddle-boxes on Captain Smith's plan, (with which the *Geyser* is also provided,)—in watering a fleet—in sounding a-head of a fleet, in navigations like those of China—in communicating with ships at a great distance, where it would be impossible to pull with oars, &c. &c.

N.

BURSTING OF EMPTY PIPES.

Sir,—Mr. Claxton's off-hand explanation of the above "singular phenomenon" lets in no new light upon the matter; he has gone upon the groundless supposition that one part of the syphon was *outside* the house, the other *inside*. This is incorrect—the whole is external, and not liable to any such vicissitudes as are imagined.

To Mr. C., and the other correspondents who attribute the bursting of the

* For [illegible]n of these see Mech. Mag., vol. xxxiv. page 255.

pipe to the condensation of vapour, the formation of water, and subsequently of ice, I beg to say, that if such an effect could possibly have been traced to such a cause, "my stock of general knowledge" would, I apprehend, have been quite adequate to the solution of the problem.

The difficulty arises solely from a positive knowledge that no water whatever was either formed or collected within the ruptured pipe, and to some far more subtle agent or agents must the mischief be attributed.

What these may be I have yet to learn, and remain

Yours respectfully,
WM. BADDELEY.

London, Feb. 21, 1842.

SELF-INKING PRINTING PRESS.

Sir,—I am at present making a model of a new description of typographic press, the chief novelty of which consists in its not requiring the aid of a workman to supply the necessary ink, which is accomplished by means of a simple and effective apparatus fixed to the end of the "*table*," or that part of the press on which the form of types is laid. The "platen" of the new construction has grooves, or other suitable means of fastening stereotype plates thereto, and a solid block of wood of the height of ordinary type is placed on the table of the press; this done, the inking rollers are adjusted, so that when the table is drawn out by means of the winch, the plates attached to the platen receive the amount of ink required. The usual "tympan" is not employed, as in other presses; its place is occupied by the "frisket," cut out, of course, according to the nature of the work. When it is desired to produce impressions by the press, you place a layer of smooth cloth, or flannel, on the block of wood resting on the table, and stretch and nail it fast at the edges. You then place the sheet of paper on this, and turn the frisket down; next roll the table under the platen and draw it down, with the requisite pressure; then draw out the table again, when, on lifting the frisket, the work will be found complete; while, at the same time, the plates are partly inked for the following impression. The rollers, consequently, go twice over the plates before they are printed from. I would have sent you a drawing of the whole, but I consider the description here sufficiently explicit to enable any mechanic to construct a press on this plan, or to alter to it any of the Stanhope, Albion, or other hand-presses in use. The kind termed the "Ruthven," is, I consider particularly adapted for the purpose, although the one I am now constructing, is of the "Stanhopean" construction, and I feel confident of its answering.

I am at the same time planning a method of adapting the principle to the same presses with ordinary types, without being restricted to the use of stereotype plates, a drawing of which I hope to send you shortly.

Sir, I am, respectfully yours,
M. I. BRAZENDALE.

February 11, 1842.

DAVIES'S ELLIPTOGRAPH.

Sir,—Will you allow me to point out what appears to me an error in the construction of "Davies's Elliptograph," described in your No. 963?

The ellipsis is proposed to be struck from one leg of the instrument keeping in contact with a circular piece of steel, so inclined as to represent the shape required, when you look at it, in a line produced from the stem *a, a*. Now, if a point were attached to the guide *i*, that point would trace an ellipsis, whose longest diameter would equal the diameter of the steel disc employed; and the guide will, in all cases, describe such an ellipse, but the ink-pen described at *d*, will move in a line *parallel* to the small ellipse. Now, ellipses, whose diameters are in equal ratios, are *not* parallel. For instance: Suppose *g* be 1 inch ⅜ths in diameter when inclined 45°, it will cause *i* to describe an oval, whose diameter is 1⅜ths and 1 inch (roughly); but slide *d*, so that it shall trace an oval, whose transverse diameter is 2½ inches, its conjugate diameter would be about 2⅛th, instead of which, it should be about 1⅞ths. What I mean, in short, is, that the "Elliptograph" would describe ovals by drawing large ones with lines parallel to a small one, which should not be.

An instrument to do what Mr. Davies's professes to accomplish, would undoubtedly be extremely useful, and I am not without hopes that the ingenious inventor will be able to overcome the defect I have pointed out.

Sir, I remain your obedient servant,
H. P.

Lambeth, February 8, 1842.

SIBERIAN GOLD MINES.

Whilst the gold mines of Brazil and Spanish America appear to be yearly falling off in their yield, those of Siberia, on the contrary, are yearly producing more. Neture (says a Russian report) has showered gold in abundance on the soil of Siberia. The eastern part of that vast country is remarkable at this time for its riches in the precious metals. The sands of the rivers there show the presence of gold in their beds from the surface—in many places, for tens of square versts—as for example in the river Grand Birussa, on the borders of the governments of Yenisseisk and Irkoutsk, and in the basins of the Tongouska superior, of the Ouderei and the Pile, which water the first of those governments. From the savage country it used to be, Siberia has become the realm of gold; its riches may now be accounted such, although the road to them has been paved with silver, it may be said, and made good by persevering industry.

The explorations of the gold mines have been chiefly extended by private adventurers from the example of those worked by the Crown. Excepting the districts belonging to the imperial mines of Kolyvano Voskressensk and Nertschinsk, or the country situated beyond the Baikal, the adventures of gold mining, and the search for veins of gold, in all the rest of Siberia, have been surrendered to privete enterprise on certain conditions. For a long time the speculators searched fruitlessly in the deserts of that vast country, and lost their capitals and their health; but at length nature yielded to the perseverance of man, gold was discovered, and its working commenced in 1829. From this date it is curious to observe the rapid development of private (alone) gold mining in Siberia, according to the following official statement:—

	Poods.	Livres.	Zolot.
In 1829	1	10	11 48-96
1830	4	22	39
1831	4	4	2 18-96
1832	15	37	40 72-96
1833	30	28	81 92-96
1834	52	29	58 36-96
1835	72	19	10 12-96
1836	84	20	9 18-96
1837	106	18	17 58-96
1838	166	22	11 60-96
1839	159	18	55 24-96
1840	211	39	40 48-96
Total of the 12 yrs.	912	1	12 79-96

Upon this quantity the Crown has received, by way of quit rent, 137 poods of gold, and the remaining 775 poods remained the property of the speculators. The pood, it is necessary to observe again, is equal to rather more than 36lbs, British avoirdupois weight.

Thus in ten years the production has increased from 1 to 212 poods per annum, from privete enterprise alone. But, in fact, the year of gold mining consists of the four months of summer only, during which the washings of the gold sands, and the extraction of gold takes place in Siberia, and particularly in its eastern parts; and it is proper to notice that all the workings were conducted by people of no experience in that branch of industry, in a country altogether unknown, covered with thick forests, impenetrable morass and mountains, where no trace of the passage of man could be found, and where savage hunters had scarcely ever set foot.

The year 1841, will, however, it is said, furnish a more irrefragable proof still of the immense mineral wealth of Siberia. Private enterprise will have extracted from it nearly 100 poods of gold more than in 1840. In this amount will be included for nearly 35 poods from the deposits discovered last year by the treder *Miasnikoff*, the working of which has not employed more than 300 labourers. "What other industry," says the report, "can, with ten men only, produce in the space of four months only, to the amount of 50,000 silver roubles of a substance which is of never-varying demand and value?—The silver rouble, it may be noted, is equal to about 3*s.* 2¾*d.* sterling.—At present the adventurers confine their enterprises to the gold to be found among the sands of the rivers, end so long as they are successful, they are likely to carry their researches no farther; but the question arises, and the solution will some time or other be sought, whence do these golden sands derive their supplies? When the river workings, which may suffice for the present age, fail, it is probable that more extensive researches will trace the mineralogical treasures of Siberia to their source.—*Mining Journal.*

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

ANTHONY BERNHARD VON RATHEN, OF KINGSTON-UPON-HULL, CIVIL ENGINEER, *for a new method or methods (called by the inventor, "The United Stationary and Locomotive System) of propelling locomotive carriages on railroads and common roads, and vessels on rivers and canals, by the application of a power produced or obtained by means of machinery and apparatus unconnected with the carriages and vessels to be propelled.*—Enrolment Office, Jan. 28, 1841.

This system of propulsion is proposed to

be carried out by the employment of compressed air, fabricated at suitable stations, by compressing apparatus worked by steam power. For this purpose, three double-action pumps, worked by a three-throw crank, or other suitable arrangement of mechanism, are placed side by side. The diameter of the working barrel of the first is 4 feet, of the next, 2 feet, and of the third, 1 foot. The larger cylinder receives its supply of air from the atmosphere, and forces it into the second, the diminished capacity of which compresses it to the extent of four atmospheres; from the second cylinder it is driven into the smaller, where, being again four times compressed, its pressure becomes equal to sixteen atmospheres. Stationary magazines are charged with compressed air of this density, which is admitted, as required, into the magazine of a locomotive engine and tender. Machinery equivalent to a steam cylinder and piston is attached to the locomotive, which, being acted upon by the compressed air, propels the engine and train of carriages along. The locomotive engine is provided with an ingenious apparatus for regulating the escape of the condensed air, so that notwithstanding its continually decreasing density within the magazine, it always exerts a uniform force of four atmospheres on the working pistons, until the whole is reduced to that pressure. Similar magazines of compressed air being placed in any vessel fitted with suitable machinery and propelling apparatus may likewise be similarly propelled.

For the purpose of transmitting the compressed air from the stationary to the moveable magazines, the patentee proposes to use a flexible pipe, composed of two thicknesses of strong cloth, with white-lead, or other cement, between them, and surrounded at intervals with strong metal rings; metal chains being placed intermediately between the rings, to give the requisite strength without impairing the flexibility. How the patentee can maintain an exclusive right to the *fabrication (!!!)* of compressed air, or to its *application* to the foregoing purposes, we know not, but he claims :—

1. The exclusive right of fabricating and preserving compressed air, to be used as a propelling power on locomotive carriages, on railroads or common roads, and vessels on rivers and canals, according to the united stationary and locomotive system.

2. The transmitting or removing the propelling power, viz., compressed air, from the place where it has been produced or obtained, to the place where it is intended to be used, that is to say, from the stationary magazine to the locomotive magazine.

3. The application of compressed air as a propelling power for propelling locomotive carriages on railroads or common roads, and vessels on rivers and canals.

4. The exclusive right to the whole combination of machinery and apparatus as before described, or such part or parts thereof as may be necessary for fabricating, transmitting, and applying compressed air to the propelling of locomotive carriages on railroads and common roads, and vessels on canals and rivers, according to the united stationary and locomotive system.

ANTHONY BERNHARD VON RATHEN, OF KINGSTON-UPON-HULL, ENGINEER, *for improvements in high-pressure and other steam-boilers, combined with a new mode or principle of supplying them with water.* Enrolment Office, January 28, 1842.

These improvements consist in a method of supplying the steam-boilers with water, not immediately, but through a number of separate closed vessels, pipes, or water chambers. The cold or condensed, or otherwise prepared or warmed, fresh water, is forced by the pump or water column, from the reservoir into the water-chamber at the end of the flues, (generally next to the chimney;) when this is entirely filled, but not before, the second chamber is provided, and if that is fully supplied, the water is forced into the third; and so through any given number of separate water-chambers, till at last the water enters the steam-chamber, or compartment where room is left for the steam to disengage itself from the heated water. By the term steam chamber is meant either a part or the whole steam-boiler, as the case may be; and in the steam-chamber, the function of regulating the water for the supply of the first chamber is carried on in the ordinary manner.

The flues through which the flame, heat, or gaseous matter is carried into the chimney are constructed so that the heated air must pass through the water vessels, and thus heat the water contained in them respectively, in a degree, diminishing in proportion with the increase of their distance from the fire-box. These flues the inventor calls external metallic flues, or double water-pipes.

It is evident that, by this mode of supplying the water and conducting it in an opposite direction with the heated air and smoke, the water will gradually become hotter the nearer it comes to the steam-chamber, which is over and next to the fire-box. And the heat passing through the flues in the interior of the pipes will, in the inverse proportion, diminish in heat the more the distance from the fire-box is increased, and the nearer they come to the chimney.

The object of this invention here generally described is, to carry the absorption of heat in the boiler as far as possible, and to

reduce the loss of heat in smoke, flame, or heated air, to a minimum.

To quicken still further the absorption of heat by the water, the upper part of the flues, or head flues, is covered with wire threads, woven or united in such a manner, that the points of the vertical wire-threads repose upon or touch the upper parts of the flues, and, projecting into the water, thereby communicate the heat more rapidly to it by radiation.

These external water pipes, or external auxiliary flues, surrounded by water pipes, can be added to every kind of boiler now in use, whether stationary, locomotive, or marine, its application to each of which is shown in the specification.

The claim is, 1. To the exclusive use and application of a new mode or principle of supplying the water successively through any given number of separate closed vessels, or water passages, to the steam-chamber, or that part of the steam-boiler where the steam is allowed to disengage itself from the water; when this mode or principle is applied in conjunction with the construction and arrangements as hereinbefore described, viz. when the water, in its way from the chimney to the steam-chamber, takes the opposite course to the flames, smoke, or heated air, which issue from the fire-box and proceed to the chimney, and when the water is so conducted as to be continually in contact with the heated air or vapours, in such manner, that in its course to the steam-chamber it is gradually increasing in heat. And when, on the other hand, the heated air or gaseous matter, in its course from the fire-box, is continually decreasing in heat, the nearer it comes to the chimney. 2. To the invention and construction of double pipes, as before described, for the conveyance of water to the steam-chamber; and of smoke or heated air to the chimney; and of the separating or water chambers made in the interior of the boiler itself. "But I limit not my exclusive right to this new mode and principle in the supply of water and conveyance of heat exactly to the specimens which I have given of its application, in the construction and shape of boilers, as well as of water vessels or pipes through which the flues pass. But I distinctly disclaim any exclusive right to any other part of the construction of steam-boilers herein described, and of the covering of the flues in the steam-boiler with wire-cloth, unless such covering of the flues is applied, as aforesaid, in conjunction with my new mode and principle of supplying water, which to the best of my belief is new, not only in England, but in any country in the world!"

LIST OF DESIGNS REGISTERED BETWEEN JANUARY 26TH, AND FEBRUARY 23RD, 1842.

Date of Registration. 1842.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Jan. 26	1071	Solomon Riley	Cantoon	1 years.
27	1072	John Mill	Letter and money balance	3
28	1073	George Ratcliff	Fender	3
"	1074	Thomas Marsh	Ditto	3
31	1075,6	Watson and Son	Carpet	1
Feb. 1	1077	Patrick Cowan	Pressure gauge	1
4	1078	B. Walton and Co.	Dish cover	3
"	1079	Albert Potter	Carpet	1
"	1080	Ditto	Ditto	1
"	1081	Wm. Ewd. Statham and Co.	Economic laboratory	3
"	1082	Lea and Co.	Carpet	1
7	1083	John Chaturn	Button	3
"	1084	Daniel Beale Harvey	Pen	3
8	1085	The Colebrookdale Company	Stove	3
"	1086	John Sheldon	Unique pocket companion pencil case	3
9	1087	Lea and Co.	Carpet	1
"	1088	McCulloch and Co.	Lithographic press	3
"	1089	Benjamin Cook, jun.	Bedstead	3
10	1090	Newcomb, Son, and Jones	Carpet	1
11	1091	Richard Grove Lowe	Protector to workmen employed on railways	3
"	1092,3	Richard Richardson	Gambroon	1
14	1094	John Chatwin	Button	3
15	1095,9	H. and J. Dixon	Carpet	1
17	1100	Thomas and C. Clark	Coffee mill	3
"	1101	John Beckett	Metallic plate	3
18	1102	H. and T. Wood	Table cover	1
21	1103	Hancock, Rixon and Dunt	Chandelier	3
"	1104	John and Francis Harwood	Letter clip	3
23	1105	Samuel Ackroyd	Fender	3

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 27TH OF JANUARY, AND THE 21ST OF FEBRUARY, 1842.

John James Baggaly, of Sheffield, seal engraver, for certain improvements in combs for the hair, and which are also applicable to combing other fibrous substances. January 29; six months.

Joseph Hughes, of Whitehall Mill, Chapel-le-frith, Derby, paper maker, for certain improvements in the method or process of manufacturing paper. January 29; six months.

James Hunt, of Whitehall, gent., for improvements in the manufacture of bricks. Jan. 31; six months.

Charles Wye Williams, of Liverpool, gent., for certain improvements in the making and moulding of bricks, artificial fuel, and other substances. January 31; six months.

Henry Fowler Broadwood, of Great Pulteney-street, Golden-square, Esq., for an improvement in that part of a pianoforte, harpsichord, or other the like instrument, commonly called the name board. February 2; six months.

William Newton, of Chancery-lane, civil engineer, for certain improved apparatus to be adapted to lace-making machinery, for the production of a novel description of elastic fabric from silk, cotton, woollen linen, and other fibrous materials. (Being a communication.) February 8; six months.

Adderley Willcocks Sleigh, K. T. S., of Manchester, captain in her Majesty's service, for a certain method, or certain methods of effecting and forming sheltered floating harbours of safety, by the employment of certain buoyant sea barriers, applicable thereto, and which said improvements are also applicable to, and useful for, the formation of breakwaters, floating bridges, light-houses, and beacons, the protection of pier-heads, embankments, and for other similar purposes. February 8; six months.

Charles Hancock, of Grosvenor-place, artist, for certain improvements in printing cotton, silk, woollen, and other stuffs. February 8; six months.

Benjamin Biram, of Wentworth, Yorkshire Colliery, viewer, for certain improvements in the construction and application of rotary engines. February 8; six months.

Frederick Harlow, of Rotherhithe, carpenter, for improvements in paving or covering roads and other surfaces, and in machinery for cutting the material to be used for those purposes. February 9; six months.

Isham Baggs, of King's-square, Middlesex, chemist, for improvements in obtaining motive power by means of carbonic acid, and also by a peculiar application of heated air. February 9; six months.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of plaited fabrics. February 10; six months.

William Brook Addison, of Bradford, in the county of York, manufacturer, for certain improvements in machinery for spinning worsted and woollen yarn. February 10; six months.

George Jarman, of Leeds, flax and cotton spinner; Robert Cook, of Hathersage, Derby, heckle and needle manufacturer; and Joshua Wordsworth, of Leeds aforesaid, machine-maker, for certain improvements in machinery for spinning flax, hemp, and tow. February 14; six months.

James Andrew, of Manchester, manufacturer, for certain improvements in the method or process of preparing or dressing yarns or warps for weaving. February 15; six months.

Charles Thomas Holcombe, of Bankside, Southwark, iron-merchant, for certain improvements in the manufacture of fuel, and in obtaining products in such manufacture. February 15; six months.

John Osbaldeston, of Blackburn, Lancaster, metal heald maker, for improvements in looms for weaving. February 15; six months.

Alexander Rousseau, of the Strand, manufacturer, for improvements in fire-arms. (Being a communication.) February 15; six months.

George Haden, of Trowbridge, Wilts, engineer, for certain improvements in apparatus, for warming and ventilating buildings. February 15; six months.

John Lewthwaite, of East-street, Manchester-square, engineer, for improvements in steam-engines and boilers. February 15; six months.

Thomas Russell Crampton, of Lisson-grove, engineer; and John Coope Haddan, of Moorgate-street, civil engineer, for improvements in steam-engines and railway carriages. February 15; six months.

Robert Wornum, of Store-street, Bedford-square, pianoforte maker, for improvements in the actions of pianofortes. February 15; six months.

Daniel Greenfield, the elder, of Birmingham, brass-founder, for an improvement in the manufacture of hollow metal knobs for the handles of door, and other locks. February 21; six months.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in treating, refining, and purifying oils and other similar substances. (Being a communication.) February 21; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND SUBSEQUENT TO 22ND OF JANUARY, 1842, AND TO 22ND FEBRUARY FOLLOWING. FOUR MONTHS EACH TO SPECIFY.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of napped fabrics. Sealed January 27.

John Jones, of the Smethwick iron-works, near Birmingham, engineer, for certain improvements in steam-engines, and in the mode or methods of obtaining power from the use of steam, part of which improvements are applicable to the raising or forcing water, and for other purposes. February 4.

James Thorburn, of Manchester, machinist, for certain improvements in machinery for producing knitted fabrics. February 4.

Nathaniel Benjamin, of Camberwell, Surrey, gentleman, for improvements in the manufacture of type. (Being a communication from abroad.) February 11.

Louis Lachenal, of Tichfield-street, Soho, mechanic, and Antoine Vieyres, of Pall-Mall, watchmaker, for improvements in machinery for cutting cork. February 11.

John George Bodmer, of Manchester, engineer, for certain improvements in propelling vessels on water, part of which improvements apply also to steam-engines to be employed on land. February 14.

George Mannering, of Dover, plumber, and Henry Harrison, of Ashford, plumber, for certain improvements in the means of raising water and other fluids. February 16.

PATENT FOR IRELAND GRANTED IN JANUARY, 1842.

Joshua Taylor Beale, for certain improvements in engines to be worked by steam, water, gas, or vapours, which improved engine may also be used as a pump.

NOTES AND NOTICES

The East India Company's Steam Frigate "Memnon."—On Tuesday morning last, this splendid vessel, of 1,100 tons burden, mounting two 64-pounders, and four 32-pounder guns, and having them and all her shot on board, with about 300 tons of coals, and a cargo sufficiently heavy to test her capabilities for a long voyage, was loosed from her moorings at

Blackwall, and proceeded down the river in excellent style, for the purpose of ascertaining the efficiency of her engines. The "Memnon" was built by Mr. Fletcher, and her engines, which are of 400 horses power, have been constructed by Messrs. Maudslay, Sons, and Field. The boilers, which are of copper, are furnished with a change water apparatus, by which the salt water is kept from exceeding a certain point of saturation, and the formation of any injurious deposit is thereby prevented. There are four steam cylinders working in pairs, the piston-rods being attached to a T-piece, from the lower end of which a long connecting-rod proceeds up to the main crank-shaft. The engines are fitted with expansion gearing, so as to admit of the consumption of fuel being regulated to suit every circumstance of slow or quick steaming. The paddle-wheels, which are of the ordinary kind, and 26 feet in diameter, are fitted with the disconnecting gear recently patented by Mr. Maudslay, and described at page 303 of our 35th volume. On arriving at Long-reach, the full power of the steam was applied, when the engines worked with a beautiful motion, the vibration being scarcely perceptible. The vessel, with her heavy cargo, was propelled by steam alone at the rate of 11½ miles per hour, to the great satisfaction of her able commander, Captain Powell. Among the gentlemen on board were Captain Pepper, of the "Ackbar," another new (Clyde-built) vessel of the same dimensions, belonging to the East India Company; Captain Brasco, attached to the Neapolitan Government; Mr. Mason, secretary to the Indian Marine; Mr. Fletcher, the builder; Messrs. Maudslays and Mr. Field, the engineers; and several scientific persons. The "Memnon" proceeded as far as the Little Nore, and during the trip, the precision and simplicity with which the disconnecting gear removed the stupendous paddle-wheel from the engine, and again attached it in an incredibly short space of time, greatly surprised such of the naval officers as had never witnessed any thing of the kind before. On reaching Sheerness, the "Memnon" was put about, and returned to Gravesend, where she will complete her stores of ammunition, &c., and in a few days proceed direct to the seat of war in China, where she will doubtless prove a powerful auxiliary to the naval force assembling in that quarter.

Whitelaw and Stirrat's Water Mill. — There has recently been erected at the manufactory of Mr. Charles Matthews, Kensham Mills, Bradninch, near this city, one of Messrs. Whitelaw and Stirrat's Patent Hydraulic Machines. This ingenious piece of mechanism is intended, and, from what we can learn, it is believed will supersede the use of the common water-wheel, forming a better application of water power. The inventors seem to have kept in view simplicity and durability, combined with economy. From its many advantages over the water-wheels now in use, it is deemed an invention of great importance, and it is thought will shortly be brought generally into use, although this, which Mr. C. Matthews has so spiritedly caused to be erected at Kensham, is believed to be the only one at present at work in England. The ingenious inventors are of Scotland, and have establishments, it is believed, both at Glasgow and Paisley. The machine at Kensham, we are desired to state, Mr. Matthews will be most happy to show and explain to any gentleman who will favour him with a call.—*Exeter Flying Post.* [The machine above alluded to was made by Messrs. Donald and Craig, here, who have made a number of these water mills, all of which are giving every satisfaction to the parties using them. They have a number of them in hand, from 6 to 60 horses power, which will soon be erected in different parts of the country.—*Paisley Advertiser.*]

Uniformity of Time.—"Now that railway travelling has become so universal in the kingdom, doing so much to annihilate *space*, the question of *time* became a matter of considerable importance, and he had long been of opinion that some plan must be adopted to prevent the errors and inconvenience of every town in the kingdom setting its clocks to a meridian of its own, different to every other place out of the same longitude. To show the extent of the evil to which he adverted, it would perhaps be sufficient for him to state that there was a difference of 25 m. 28 sec. between the times at Dover and Falmouth; that is to say, when it was noon at Falmouth, it was 25 m. 28 sec. past noon at Dover. There was nearly a minute difference in time between the east and west of London, and about a quarter of a minute difference between the east and west of Birmingham. The railroad directors had endeavoured to remedy this defect by keeping London time at all their stations; but there was this great inconvenience attending it, that all persons who resided west of London were in great danger of being too late for the trains. On all the time tables of the Great Western Railway an endeavour was made to remedy this difficulty by printing the correction for longitude. It occurred to him a year or two ago that it would be a very excellent plan if government would recommend the adoption of one uniform time throughout the kingdom; and he was happy to find that his friend, Mr. Dent, had turned his attention to the same subject, and he quite agreed with him that they ought to adopt one meridian as a universal standard, and call it "British time." Happening to mention this subject to his friend, Mr. Rowland Hill, as a matter of some importance in connection with the post-office department, he informed him that he had received a letter from Captain Basin Hall, in 1840, on this very point; and as it embodied all that he (Mr. Osler) wished to say respecting it, he would, with the permission of the audience, read the letter to them. The lecturer here read the letter of Captain Basin Hall. The idea of the adoption of a general standard for time throughout Great Britain originated with the late Dr. Wollaston, who suggested that all the post-office clocks throughout the different counties should be kept at London time, a measure which he considered might be very easily accomplished, and which would greatly simplify all those arrangements of the post-office in which time was included as an element. He proposed to regulate all the post-office clocks in the kingdom by means of the time brought from London daily by the mail coach chronometers; and he had no doubt, that ere long, all the town clocks, and eventually all the clocks and watches of private persons, would fall into the same course of regulation; so that only one expression of time would prevail over the country, and every clock and watch indicate by its hands the same hour and minute at the same moment of absolute time."—*Mr. F. Osler's Lect. Birm. Phil. Inst.*

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MERRYWEATHER'S MARINE FIRE-ENGINE.

Fig. 1.

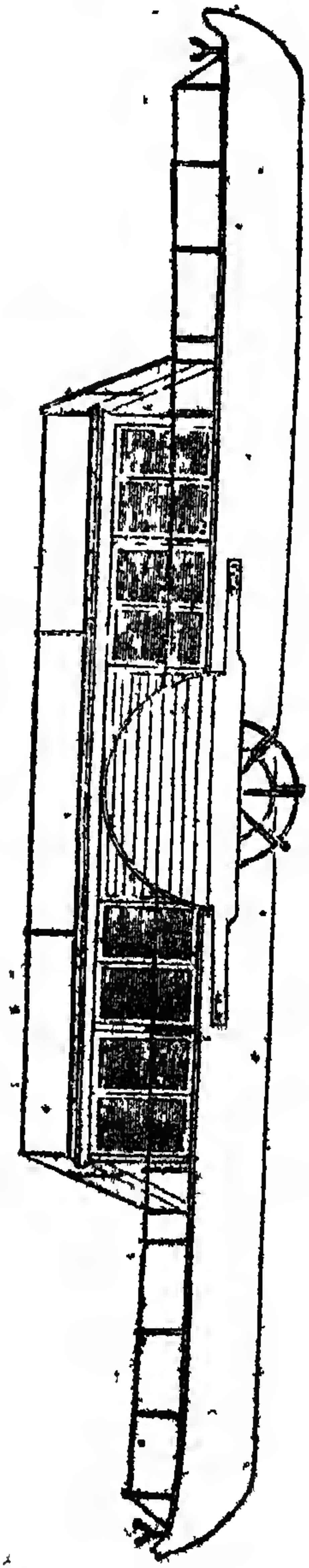
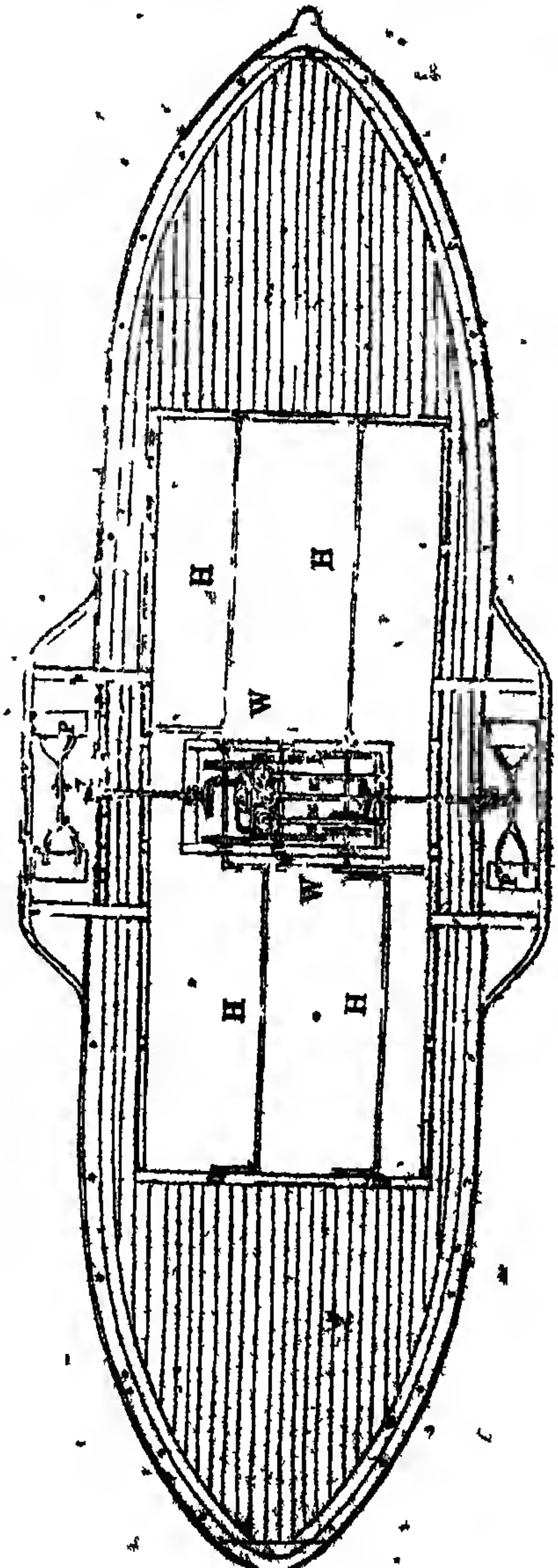


Fig. 2.



LONDON FIRES IN 1841.

"There is no danger so much to be dreaded,
There is no enemy so sure to conquer,
There is no death that we should so much fear,
Except bold infidelity—as Fire.
For with an enemy you may contend and conquer;
From the man-slayer you may by flight escape;
From beast of prey you may come off the victor;
From swelling billows you may swim to shore;
But with the raging flames who may contend?"

Sir,—It was well observed in the "leading journal," a short time since, that "probably a concurrence of disasters, similar to that under which Great Britain now suffers, never before visited the metropolis of a mighty nation. Famed alike for laws, for commerce, and for arms, she now sees, in time of peace, and without either hostile inroad or intestine broils, her palace of legislature, her emporium of trade, and her storehouse of trophies and of arms—all at one moment in ruins—and each by a like calamity!" The great destroyer, Fire, has been busily employed in the metropolis during the year just ended, as will appear from the following tabulated epitome of his doings, which shows that, during the year 1841, there were in London and its suburbs 696 fires, viz.:—

MONTHS.	Number of Fires.	Number of Fatal Fires.	Number of Lives Lost.	Chimneys on Fire.	False Alarms.
January	59	0	0	9	4
February	68	1	1	9	5
March	63	1	1	10	2
April	59	0	0	10	4
May	56	1	2	10	3
June	50	2	2	8	5
July	45	1	1	9	5
August	63	0	0	2	11
September	51	2	2	2	6
October	67	3	4	9	7
November	63	3	4	5	6
December	52	2	2	9	9
Total	696	16	19	92	67

Of these fires, the number wherein the premises were totally destroyed is	24
Ditto ditto ditto very seriously damaged	234
Ditto ditto ditto slightly damaged	438
Alarms occasioned by fires in chimneys	92
False alarms	67
Making the total number of calls	855

The number of instances in which an insurance had been effected on the Building and Contents was	343
On the Building only	149
On the Contents only	52
Neither insured	152
	696

But this statement only relates to the premises in which the fire *commenced*. A rigid scrutiny into the subject of insurance, as connected with all the properties *damaged* by these fires, gives the following interesting and important results:—

Buildings insured	914
Contents insured	609
	1523
Buildings not insured	197
Contents not insured	404
	601

The number of fires still continues to increase. By reference to former reports, it will be seen that last year's fires exceeded, by fifteen, the number of the previous year; being a gross increase of 278 upon the average number of the first seven years' experience of the London Fire Establishment.

The number of false alarms and of alarms arising from chimneys on fire is considerably below the average.

An almost incredible number of fires in chimneys have been attended by the firemen of the establishment; but as they were known at the time to be such, and were only attended accordingly, they are not reported. In several instances where the firemen have been denied admittance, and their proffered services refused, the consequence has been, that the fire has insinuated itself into contact with some combustible part of the building, and the inmates have eventually been obliged to send for the men whose services they before so unwisely rejected.

Of the twenty-four total losses, seven of the fires were so distant from the nearest London engine station, as to preclude all possibility of rescuing the premises in which the fire began. In seven cases, the firemen had to contend against a total deficiency, or very scanty supply of water, which paralyzed their efforts, and rendered their prompt attendance unavailing. In the remaining instances, the total destruction of the premises was attributable either to the highly inflammable nature of their contents, or to their small dimensions, and the head to which the flames had attained before discovered. This class of fires comprised the following:—

Jan. 20, 4 A. M. Mr. Wilshire, tallow-chandler and melter, Crucifix-lane, Bermondsey. This fire, which commenced in the manufactory, had made great progress in its ravages before it was discovered. A strong muster of firemen and engines were quickly on the spot, but the supply of water was for a long time exceedingly scanty, and the manufactory and stable were destroyed; a better supply of water being ultimately obtained, enabled the firemen to rescue the dwelling-house, shop, and five other buildings to which the flames had communicated.

January 29, 4 A. M. Mr. Budd, chandler, North-street, Whitechapel-road. This was a small one-story house, which was destroyed before the engines could be brought to bear upon it. The two adjoining buildings, to which the fire had extended, were, however, preserved, with but little damage.

February 1, 8½ P. M. Mr. Stetre, cabinet-maker and upholsterer, Kew Horse-road, Richmond. This fire commenced in the workshops, which were consumed; but the dwelling-house and two adjacent buildings were preserved, with but little injury, although the nearest London engine station is 10 miles distant.

February 2, 10¼ A. M. Messrs. Painter and Co.'s furniture-warehouse, Finsbury-place, North. These premises were constructed in a very peculiar manner, having in the centre of the interior an opening upwards, surmounted by a dome, which from the basement to the roof displayed a number of galleries; the premises formerly belonged to Mr. Lackington, the celebrated bookseller, and during his occupancy, one of the royal mail-coaches was driven, (four-in-hand,) round the circular counter which occupied the space beneath the dome; this feat was repeated a few years ago, by Alexander, of Chiswell-street, for a wager of 200*l*. At the time stated, flames suddenly burst forth from the third floor, which comprised show-rooms filled with upholstery, bedding, &c. A number of workmen who were employed upon the premises strove for a time to suppress the flames; but finding their efforts unavailing, and the fire spreading with great rapidity, they retreated to the lower floors, and commenced removing some of the most valuable of their contents. In the mean time, messengers having conveyed intelligence of the fire to the several engine stations, a strong muster of men and engines were soon in attendance. The first, from the Whitecross-street station, and one from Messrs. Whitbread's brewery, were on the spot within a quarter of an hour after the alarm was given, and these were rapidly followed by engines from the other stations, as well as those belonging to the West of England and County Fire Offices, which were got into operation as quickly as possible. The construction of the premises and the highly combustible nature of their contents, however, caused the flames to rage with a fury that was altogether irresistible; by eleven o'clock the fire presented a truly awful appearance, the immense building, from the ground to the roof, with a frontage of nearly 100 feet, was one mass of flames

which raged half way across this wide street, the heat igniting ten of the houses on the opposite side. The fire soon communicated to the buildings on either side of those belonging to Messrs. Painter, and it seemed uncertain where the work of destruction would be stayed; soon after half-past eleven, however, the roof of Messrs. Painter's premises fell in with a tremendous crash, and considerably damped the fire, which temporary check was taken such good advantage of by the firemen, that in an hour after, all fear of further damage was at an end. Throughout the day the frost was most intense, and many of the firemen suffered severely from the cold. Notwithstanding the number of hours they were engaged, and the extraordinary difficulties under which they laboured, they never flagged until the fire was completely subdued. No less than 17 buildings were more or less damaged by this fire, the origin of which was never satisfactorily explained.

February 7, 11¾ P.M. Camberwell Old Church. This venerable fabric, some portions of which are nearly 1100 years old, was discovered to be on fire by a police constable, P 29, who, seeing a light in the organ gallery, sent information thereof to the inspector at the station-house, who, supposing robbers were in the church, sent a serjeant and two constables to secure them. In the mean time, the flames bursting forth from the tower, at once revealed the real character of the intruder. The parish engine was got out, but no water was forthcoming to make it available, and messengers were dispatched to town for the engines; but the "illumined sky" foreheralded their message, and the brigade engines from Waterloo-road, and Southwark-bridge-road, closely followed by the West of England, were soon on the spot, and were quickly succeeded by several others. A small pond of water being discovered in an adjoining field, one of the brigade engines was drawn up to it, and made to supply a second, which was placed intermediately and brought to bear upon the fire; but this supply was so small, as to be exhausted almost as soon as the engines got into full play. The West of England engine was judiciously placed at a plug in the Grove, and its hose was led through the house of Mrs. Hutton, who kindly consented to this arrangement, after her less liberal neighbours had refused a passage. Upwards of five hundred feet of leather hose was attached to this engine, and after a delay of nearly two hours a supply of water from the Vauxhall main at length issued from the plug, and was brought to bear upon the burning pile. One of the brigade engines ultimately took up a similar position, and joined its efforts towards cooling the ruins. It appears, that the stove which heated the church was situated under the north entrance, its chimney, or flue, extending to the flooring in the centre of the middle aisle, and thence through the south side of the organ-loft to the top of the tower; the end of one of the principal beams that supported the organ-loft, had evidently projected into the centre of the flue, and it is supposed that soot having from time to time been deposited upon it, had been ignited on Sunday morning and set fire to the beam, which burned slowly until it reached the wainscoting of theorgan-loft, when it burst into flames.

"Then sighed a shaddwy sound
From the high loft where organ pipes were glowing
In the red fire, a golden radiance throwing
On the wide wreck around.
"'Passing away! away!'
Breathed those stupendous diapasons, mourning
Each for his fall; as of the tempest warning,
Winds sigh at close of day.
"Then came a wondrous sight!
Mitres, and robes, and shrouds of marble, glimmered—
Or, argent, azure, sanguine, purpure, shimmered
E'en in the depth of night!
"Then round the finialed spire
Curled a bright flame, o'er tabernacle fretted,
Licking the ancient dust in groins carvetted,
Through that majestic choir."

The appearance of the church by the time the engines from town reached the spot, was awfully sublime, and will never be forgotten, "while memory hold its seat," by any of those who witnessed the spectacle. The night was moonlight, and very frosty. The distance (three miles) and the water being two hours late, prevented the firemen from saving more than a small portion of the chancel, in which a happy couple were united in the "silken bonds of wedlock" on the following morning.

February 16, 3½ A.M. Mr. Hyde, butcher, 112, Bermondsey-street. This fire, which originated from some unascertained cause, had attained a great head before its existence was discovered, and soon after its outbreak the whole of the building was on fire from top to bottom. The firemen with their engines were promptly on the spot, but their exertions were paralyzed (as is almost always the case in this locality) for want of water; upwards of three-quarters of an hour elapsed before any was obtained (and then the supply was scanty) from the Southwark mains. By great efforts the firemen preserved the back kitchen, slaughter-house, and live stock unscathed.

April 7, 8½ A.M. Mr. Turner, floor-cloth and table-cover manufactory, Myddleton-street, St. John-street-road. These premises, which occupied an area of considerable dimensions between Myddleton-street and Lloyd's-row, consisted of three brick buildings — the factory, the japan and store rooms, and another building of similar dimensions, used as a drying house. The workmen had returned from breakfast at half past 8 o'clock, when every thing seemed to be safe, but they had scarcely resumed their labours when a cry was raised that the japan roofs were on fire: from this part of the building the work of destruction extended with such extraordinary rapidity, that within an hour the workshops and stables were levelled with the ground. The Farringdon-street, Holborn, and other engines were promptly on the spot, and a plentiful supply of water being obtained, by half-past 10 o'clock the fire was completely subdued, but not until the whole of Mr. Turner's premises had been destroyed, and seventeen of the surrounding buildings more or less injured.

June 8, 4½ A.M. Astley's Amphitheatre, Westminster-bridge-road. On the 8th of March this property had a narrow escape from destruction in consequence of an escape of gas, by which the flooring and joisting was scorched in a cellar under the stage, and there is every reason to believe that a similar accident upon this occasion led to the destruction of the building. At the time stated, police constable Cotterell, of the L division, who was passing down Stangate-street, observed smoke issuing from the roof of the theatre, and immediately ran to the stage-door, and knocked up Howell, a fireman belonging to the West of England Fire Office, who was retained nightly on the premises. On proceeding together into the theatre, they found a great body of fire raging beneath the stage; Howell seized the branch-pipe of a fire-pump which was placed at one corner of the stage, and begged Cotterell to work the pump: from some cause or other his request was not attended to, and being overpowered by the heat and smoke, Howell was obliged to drop the branch-pipe and make his escape. Within a few minutes after the alarm was given, the West of England engine, and that from the brigade station in Waterloo-road reached the spot, and in less than a quarter-of-an-hour at least half-a-dozen powerful engines were stationed around the burning premises, ready for action as soon as water could be procured. Mr. Ducrow's house was only separated from the theatre by a slight partition, the sleeping rooms being on the second floor, over the box and pit entrances.

By dint of great exertions, the beautiful stud (with the exception of two horses and an ass) were saved. By 5 o'clock the whole of the theatre was one mass of livid flame, and presented an appearance resembling a mighty furnace. The attention of the firemen was directed to the preservation, if possible, of Mr. Ducrow's dwelling-house, as well as the numerous buildings which abutted all round the theatre; and their exertions were ultimately crowned with well-deserved success. The flames being vigorously opposed on all sides, the work of destruction was confined to the theatre; the surrounding buildings, to the number of twenty-five, being more or less injured, but none very seriously.

June 21, 3½ A.M. Messrs. Harris and Billiter's oil warehouses, Mazepond, Southwark. This fire, which originated from some unknown cause, had gained a great head before it was discovered, and when it burst forth, from the highly inflammable nature of the stock, which was very heavy, it raged with a fury that defied all opposition. A strong force of firemen and engines were soon on the spot, but for three quarters of an hour no water could be obtained; the fire spread rapidly in all directions, and the extensive premises of Messrs. Fisher and Sons, leather-dressers, as well as those in which the fire commenced, were entirely destroyed. Water being ultimately obtained, the fire was stopped, but in addition to the foregoing, twenty-four buildings were more or less damaged.

July 2, 11 P.M. Mr. Reilly, chairmaker, Quicksett-row, New-road, Marylebone. From the quantity of small timber on the premises, the flames spread with the utmost rapidity; the dwelling-house being destroyed, and the workshops very seriously damaged.

July 10, 3¾ P.M. Mr. Nott, builder, High-street, Deptford. This fire commenced in the workshops in the rear of the timber-yard, through the shavings having ignited. The workmen endeavoured in vain to subdue the fire, and were compelled to retreat, the flames rapidly extending to the timber-yard, thence to the dwelling-house, and to several of those adjoining. A special train on the Greenwich railway brought intelligence to the brigade stations in town, from whence engines were immediately despatched, but before they could possibly reach the spot (four miles distant) Mr. Nott's premises were destroyed, and five other buildings on fire. Upwards of half-an-hour elapsed before water could be obtained, when a supply at length being procured from the Lewisham mains, the London and local engines were got to work, and succeeded in extinguishing the fire; three buildings being consumed, and eight more or less injured.

August 11, 1½ A.M. Mr. Waller, private dwelling-house, situate on the summit of the

hill, in the Grove, Blackheath. This extensive building was discovered to be on fire by police constable R, 199, who, with great difficulty, aroused the inmates to a sense of their danger; they were, however, by great exertions, got out in safety. The flames, which illuminated the heavens, soon put the London engines in motion, and that from Southwark-bridge-road, which travelled the distance (five miles) in twenty minutes, was the first to arrive, and was received with loud cheering from the persons assembled. Unfortunately, however, it was too late to save any portion of Mr. Waller's premises, which were one body of flames, but water being obtained, the firemen stopped the fire in the adjoining premises, to which it had communicated.

August 30, 3 A.M. Messrs. Cock and Son, plumbers, painters, and glaziers, Grove-road, Mile End-road. This fire commenced in a small timber building, used as a two-stall stable, the loft over it being filled with oil, paint, &c., which was entirely destroyed before the arrival of the firemen.

September 12, 9 P.M. Mr. Salmon, fruiterer, 86, Piccadilly. When first discovered by some passers-by in the street, the fire seemed to be confined to the centre part of the building, but spread with such rapidity, that before the inhabitants of the adjacent houses could be acquainted with their danger, the flames burst up through the roof, illuminating the neighbourhood, and within a quarter-of-an-hour the, building was wholly enveloped in flames. A strong force of men and engines from the County, West of England, and the brigade stations promptly reached the spot, and water being obtained, they succeeded before eleven o'clock in arresting the progress of the flames. Soon after this time a party of four firemen entered the partially gutted house to extinguish some remaining fire, which showed at the back, when the roof and party wall fell, burying West and Weaver of the County fire-office, in the ruins; the former was killed upon the spot, but the latter, after a delay of five hours, was got out alive, but seriously injured. The origin of this fire was supposed to be not accidental, but it remains to this day involved in mystery.

September 18, ½ A.M. Mr. Driscoll's lodging-house, Prussian island, Old Gravel-lane, Wapping. The fire commenced from some unknown cause in the lower part of this house (a very small one of timber), and the inmates escaped with the utmost difficulty. The building was completely destroyed, but six others, to which the fire had extended, were preserved by the timely arrival and prompt exertions of the firemen.

ber 11, 3¾ A.M. Mr. Merry, cheese-r, High-street, Newington Butts. This disastrous fire originated in the shop, and had gained such an ascendancy when discovered, as to cut off the retreat of the inmates, which consisted of Mr. Merry, his brother, mother, and a female servant. The two former escaped from the first-floor windows, but the two latter fell victims to the conflagration. The rapid progress of the flames, and the slight character of the building, caused it to fall in less than three quarters of an hour after the discovery of the fire.

October 4, 1½ A.M. Messrs. Daily and Co., leather-dressers, Bermondsey-street. This fire originated at the back of Messrs. Daily's premises. In a few minutes after the alarm was given, the flames extended to a workshop, and thence to Messrs. Daily's dwelling, the inmates of which had barely time to escape by the roof. The firemen and engines were soon on the spot, but no water could be obtained for some time, and the flames communicated to the patent felt manufactory of Mr. Abbott, next door. In about a quarter of an hour a scanty supply of water was obtained from the Southwark plugs, and a few engines being got into operation, the fire was stopped; Messrs. Daily's premises being completely destroyed, and six adjoining buildings slightly damaged.

October 27, 10½ P.M. Mr. Clitheroe, firework-maker, John-street, Bethnal-green. This house had not been long on fire before a quantity of gunpowder exploded, and blew down the building.

October 30, 10¾ P.M. Small gun armoury, Tower of London. This fire, the most important during the year, appears to have been seen as early as nine o'clock, when a light was observed in the Bowyer tower, but as it almost instantly disappeared, no notice was taken of it; smoke was seen to issue from this part of the building by other parties shortly before ten o'clock. It was not until a quarter before eleven, however, that the appearances assumed such an unquestionable shape, as to lead to the alarm of fire being raised.

"The Cybele of cities stands veiled with the
night,
But why are the turrets that crown her
so bright?
Those halls which for ages were silent and
cold,
Shine forth as when lit for some banquet
of old.
But what mean the thunders which peal
on the breeze?
Ah! surely no sounds of the revel are
these;
The tower hath a guest, though in silence
he came,
And the festival there is a banquet of
flame."

The astounding intelligence spread rapidly, and engines from various stations were soon assembled at the Tower gates, but admission was for some time denied them. Meantime the garrison having been roused, the Tower engines (six in number) were turned out; but they were in no condition to meet the exigencies of the case, and orders were subsequently given to admit those which were assembled at the western gate. These were immediately drawn up in the broad walk opposite the principal entrance of the Armoury, and the firemen led their hose up the grand staircase, with a view of proceeding to the roof commanding the Round Tower, to which the fire was still confined. In consequence of the great excitement and confusion which prevailed, however, the firemen could not ascertain the mode of access to that part, and in the interim, the small quantity of water in the tanks was exhausted.

Soon after eleven o'clock, the destruction of the Round Tower was complete, and the flames had penetrated into the roof of the Armoury. Two of the brigade engines in front of the building being supplied with water by others placed near the river, their respective engineers entered the Armoury with their branches, and directed their jets upon the ceiling wherever the fire showed itself. After maintaining this position for nearly half an hour, part of the ceiling fell, and exhibited the roof completely enveloped in fire; upon this the firemen retreated, and had scarcely left the room, when the whole of the ceiling fell down. Although a gallant stand was attempted to be made, it was soon apparent that the fate of this building was sealed, and the attention of the firemen and others became directed to the preservstion of the White Tower, the church of St. Peter, and the Map-office, all of which were at this time in great danger.

By about half-past eleven o'clock, an awful but magnificent spectacle presented itself to the eyes of a countless multitude, who had assembled on Tower Hill:—

"With terror and tumult from hovel and hall
They come, for one beacon hath summoned them all,
The far-seen and fire-crested summit, whose glow
Falls fearfully bright on the city below."

The splendid Armoury throughout its vast extent poured forth volumes of flame, the light of which was reflected from surrounding objects through a thick hazy atmosphere with dazzling refulgence. By twelve o'clock, the conflagration had reached a frightful magnitude, flames were gushing forth from every window of the Armoury, and the heat became so intense, that it was impossible to stand on the broad walk between the Armoury and the White Tower.

The Map-office, which was the corner house on the east side of the square, was fired in the roof by the intensity of the heat, and it was evident that if the flames were not arrested at this point, the consequences would be awful.

The land engines were by this time for the most part placed *hors de combat* for want of water, but the floating engine having arrived from Southwark Bridge, this powerful auxiliary was brought to bear upon the jeopardized buildings with the best effect; the hose being led up to the top of the building, the roof was soon cooled by the drenching columns of water poured upon it, and the fire about the window frames, &c., having been extinguished by buckets of water applied from within, the progress of the flames in this direction was completely stayed. This done, the hose of the floating engine was shifted round to the rear of the armoury, where the Old Mill Barracks and the dwelling-houses in the Mint were now in considerable danger. The floating engine from Rotherhithe having subsequently arrived, it was set to work to cool the burning ruins of the Armoury, and to the presence of these powerful auxiliaries the preservation of the remaining portion of the Tower is mainly attributable. In consequence of the continual rise of the ground from the river, these engines worked at a great disadvantage; the labour to the men was excessive, and the works of the engines and hose were exposed to an enormous strain, while the jet of water thrown from the branch-pipe was powerless in the extreme. Perhaps the legitimate use of these powerful machines under such circumstances is to furnish a supply of water to other engines placed nearer to the fire, so as to be capable of being brought to bear with full effect upon any point that may be required.

By five o'clock, the extent of the conflagration was defined, and all apprehension of further danger was at an end, but the heat within the Armoury walls was so great, as to make it necessary to keep several engines in full work, and in the discharge of this duty one of the brigade firemen (Richard Wivill) lost his life. It appears he was standing a short distance from the Armoury-wall, holding the branch pipe of an engine, when a large mass of brickwork fell, and striking the door way rebounded on to Wivill's head, killing him on the spot. With the exception of Wright (one of the County firemen) who had his arm and some of his ribs broken, this was the only serious accident that occurred.

A lengthened investigation into every circumstance connected with this fire, took

place before a committee of inquiry, but the result of their labours did not fix its origin with any degree of certainty; the general impression, however, is, that it was occasioned by some defect in the flues of the apartment where it commenced.

November 7, 11½ P.M. Mr. Baxter, Hatter, London-street, Greenwich. This fire, which originated from some unknown cause, burned with great fury, and though the local engines were brought to bear as expeditiously as possible, they were unable to hold the flames in check. The distance being upwards of four miles from the nearest brigade station, the London firemen could not reach the spot in time to save any portion of Mr. Baxter's premises, but they were successful in preserving four other buildings to which the flames had communicated.

November 14, 1¾ A.M. Messrs. Kindon and Bathe, floor-cloth manufactory, corner of Wellington-street, Blackfriars-road. No appearance of fire was visible in this building until the flames suddenly burst forth simultaneously from several portions of the roof of the building. A number of engines were on the spot with incredible rapidity, that from Farringdon-street being first, and a plentiful supply of water was obtained both from the Lambeth and Vauxhall mains; but the nature of the building, and the highly inflammable materials which it contained, as well as the extraordinary progress of the fire before discovered, precluded the possibility of saving any portion of the manufactory. The dwelling houses of Mr. Kindon, Mr. Crafter, and others, to which the flames had communicated, were, however, preserved, although ten buildings, in all, were more or less damaged. By five o'clock the fire was confined solely to the fallen ruins of Messrs. Kindon and Co.'s manufactory, to cool which, the engines were kept going all Sunday forenoon. About eight o'clock two of the brigade men, named Parkes and Webb, in direct opposition to the orders of Mr. Braidwood and their foreman, and the remonstrances of their comrades, made their way into the ruins with a branch to extinguish a few embers which showed in the walls; they had not been in many minutes, when the lofty walls on the west side, with the gable end of the south wall, fell inward with a terrific crash, burying the two unfortunate young men beneath an enormous mass of ruins. The most strenuous exertions were made to extricate them, but nearly three hours elapsed before Webb was found, dreadfully crushed and mutilated; Parkes was found in about an hour afterwards, apparently dead from suffocation, no bones being broken.

December 20, 5 P. M. Messrs. Wright and Skelthorp, riggers, Preston's-fields, East India Dock-road, Poplar. These premises, which consisted of timber buildings, were filled with a large stock of marine stores, of various descriptions. The fire commenced in the tarring sheds, which, with the stable, rigging loft, and rope ground, were completely destroyed in a short space of time.

December 25, 1½ A. M. Mr. Lavill, poulterer, High-street, Camberwell. This fire originated, as is supposed, from an escape of gas, in the lower part of the building, and ascended so rapidly, that it was with great difficulty the inmates effected their escape. The firemen were in attendance as quickly as the distance from town would permit, but no water could be obtained for upwards of an hour; at the end of that time a scanty supply issued from the Vauxhall main, but not sufficient to supply one engine! Mr. Lavill's house was completely destroyed, and six others damaged.

Same morning, 8½ A. M. Messrs. Brownrigg and Cockerell, Eagle saw-mills, Old Brompton. The firemen had scarcely extinguished the fire at Camberwell, when they were called to another of a very serious character, (at 6½ A. M.,) in Dacre-street, Westminster, and while there engaged, they received intelligence of that at Old Brompton. The distance being three miles from the nearest station, the saw-mills were consumed by the time the firemen reached the spot: making the twenty-fourth and last fire of this class.

Among the fires at which serious damage was done may be noticed the following, most of which were attended with peculiar difficulties, and called forth a proportionate degree of skill and intrepidity on the part of the firemen.

January 3, 7 A. M. Streatham Old Church. On this morning the metropolis and its suburbs were visited by a terrific storm of thunder and lightning. The first flash of lightning was awful, illuminating the whole horizon, and in its progress struck the steeples of Spitalfields and Streatham churches. Smoke was shortly afterwards seen to issue from the latter, which was soon followed by flames. The parish engine was got out, but the fire was altogether beyond its reach; and a mounted messenger was instantly despatched to town for more efficient assistance. The engines from the Waterloo-road, Southwark-bridge-road, Morgan's-lane, and Watling-street, with an extra supply of leather hose, were started with all possible haste; and notwithstanding the extraordinary state of the roads, from the effects of the storm, they were soon on the spot, and water being obtained, were got to work. A quantity of hose being joined together, and led up into the steeple, the firemen soon brought the engines to bear

on the burning pile, with such good effect, that the flames were stopped midway, and the work of destruction confined to the upper half of the wooden spire.

January 28, 3½ A.M. Mr. Bundy, trunk-maker, 138, Fleet-street. This fire, which appears to have originated from a piece of timber projecting into a flue in the back shop, was discovered by one of the City police, who lost no time in arousing the inmates and their neighbours to a sense of their danger. The former were extricated in safety, and in the first instance sheltered in the station-house. The flames raged most furiously at the back of the premises, and ascending the staircase, entered every room, of which the door happened to be open. The firemen and engines from Farringdon-street were on the spot and at work in less than ten minutes, the men boldly dashing up the stairs with their branches, following the fire into every room, until it was completely extinguished. In this they were ably supported by the men and engines from Watling-street and other stations. The *Dispatch*, speaking of their exertions, observes :—"The conduct of the firemen was beyond all praise; they individually exerted themselves, and concentrated their efforts so effectually as to secure a mastery over the fire, seldom or never before witnessed." The building was a lofty one, of "olden time," with wide staircase, and galleries abounding in timber; and the great risk the gallant fellows ran, in their successful efforts to stop this fire, was evidenced by the fall of that and the adjoining building, at 10 o'clock at night of Saturday, the 27th of February, most miraculously without injuring a single individual.

February 16, 10¾ P. M. Mr. Harlott, private dwelling, Berwick-place, Grange-road; Bermondsey. This fire, which was caused by bringing a candle in contact with curtains, burned with rapidity; the firemen and engines were soon on the spot, but an hour elapsed before even a scanty supply of water could be obtained from the Southwark main, by which time the dwelling was almost destroyed; but a back kitchen was preserved, by dint of great exertions. This was the second disastrous fire, this day, in the district supplied by the Southwark water-works, where a want of water caused the destruction of property to a great amount.

March 10, 1¼ A. M. Mr. Freeman, beer-shop, Parsons-street, Upper East Smithfield. The only person in the house at the time was a female servant, named Ann Dillon, aged 22, of sober and careful habits. On the fire being discovered, and an alarm raised, the firemen and engines from the Wellclose-square station, (distant only a few hundred yards,) were instantly on the spot and arrived just as the young woman appeared at the second floor front window, imploring assistance. To get at her was beyond all human power, as the flames were bursting forth from the lower part of the house, and extending across the street. Water being obtained, the fire was soon got under, and the unfortunate female found suffocated. The shop and staircase were destroyed, and upper floors seriously damaged.

March 16, 6½ P. M. Mr. Garrard, Loman-street, Southwark, japanner and waterproof leather hat-maker. This fire commenced in the drying-stove, and, from the highly combustible nature of the materials, the flames had gained a great ascendancy before any opposition could be made to them. The engines from the Waterloo-road brigade station, the West of England, Southwark-bridge-road, and others, were prompt in their arrivals, but they laboured under a sad deficiency of water, being for some time dependent on a small supply from Messrs. Lee's yard, opposite. The stove, with its contents, and the finishing shops, were destroyed; but the remainder of the premises, as well as three buildings adjoining, which had ignited, were preserved. This fire was scarcely got under, when the firemen were summoned, at

—— 7¾ P. M., to the South-western Railway Terminus, at Nine Elms. The following authentic narrative of this fire is abridged from the *Railway Times* of March 20. "The premises consisted of a two-story brick building, divided into three compartments; they were situated on the west side of the terminus, at the extremity of the station from whence the trains start. At the time mentioned, the store-keeper and two assistants went into the warehouse nearest the station, which was filled with cotton, hemp, tallow, oil, and other combustible matters, with an open light, which coming in contact with some turpentine from a leaky carboy, the place was instantly in flames. Messengers being immediately despatched, they found Mr. Braidwood and a body of firemen in Gravel-lane, from whence the Watling-street engine was galloped off with all possible speed towards Nine Elms, and was rapidly followed by others. In the interim, a small engine from Mr. Beaufoy's chemical works, and another from Messrs. Burnett's distillery, reached the fire, but they were not accompanied by any person competent to cope with the difficulties which attended their useful application. Most of the persons present seemed so panic-struck, as to be incapable of rendering the slightest service, or of giving such information, as to where water could be obtained, as would enable others to do so. The second division

of the building, used as engineers' workshops, and a depository for stores connected therewith, soon became enveloped in flames; and by 8 o'clock, when Mr. Braidwood arrived, these two portions of the building were one vivid mass of fire, from the roof to the ground. A most disgraceful scene now ensued; there was abundance of water flowing from the Lambeth plugs, in the road opposite the terminus, but the railway authorities insisted on the engines being driven inside the station, where no water could be obtained. Mr. Braidwood was hustled and assaulted, and the operations of the firemen for a time wholly frustrated. While this conflict was going on, the flames were fast extending to the third division of the building, the roof of which was on fire, when Mr. Baddeley ran Beaufoy's engine down to that end of the building, and got it to work from a small tank of water which fortunately happened to be there. Alderman Humphrey, who was present, assisted, both with his counsel and exertions, in this judicious and well-timed movement, which proved eminently successful, the fire in the roof being quickly extinguished, and this portion of the premises was preserved, comparatively uninjured. The railway officials, seeing at last the folly of their opposition to the firemen, were content to permit them to proceed in their own way; their first endeavours were to preserve the carriage department, and the safety of this building having been secured, they then proceeded to the other end of the building, following up the advantage previously gained in that direction.

"It seems to us extraordinary that, in premises of such extent, and containing such an immense amount of property, no local provision whatever should have been made for the suppression of fire; and under such circumstances, we think a little more courtesy might have been expected towards those who came for no other purpose than to render the utmost possible assistance."

April 21, 11½ A.M. Messrs. Graham and Sholt, lucifer match makers. It may perhaps be within the recollection of some of your readers, that these premises were seriously damaged by fire, attended with loss of life, nine months previous. Upon this occasion the inmates escaped with their lives, but the fire raged most furiously; the back part of the premises was entirely destroyed, and the front building preserved with great difficulty, as were three adjoining buildings.

April 30, 9½ P.M. Mr. J. Stewart, St. George's Hotel, Albemarle-street, Piccadilly. This fire commenced in a back bedroom on the second-floor, from a candle having been brought in contact with the bed-curtains; on the fire being discovered the inmates of these extensive premises became panic struck, and instead of making the slightest effort to suppress the flames, persons of both sexes and of all grades were seen running away with the first article they could lay their hands on, to a place of safety. In the interim, the flames spread from room to room, and from floor to floor, until the whole of the double building was one mass of fire. The engines of the brigade, the West of England, and the County, with a strong body of firemen, were soon in attendance, and, after a delay of nearly twenty minutes, a plentiful supply of water being obtained, the premises were completely surrounded, and the spread of the fire stopped on all sides. The greater portion of the Hotel, with its varied and valuable contents, was destroyed, and seven adjoining buildings much damaged.

May 3, 11½ P.M. Mr. Berlyn, dealer in marine stores, Church-lane, Whitechapel. A passer-by perceiving a strong glare of light in the shop, gave the alarm of fire, and with the policemen endeavoured to rouse the inmates to a sense of their danger, but no one appearing, the street-door was broken open, when a mass of flame rushed forth, driving all before it. Almost immediately after this, Mr. Berlyn appeared at the second-floor window with a little girl (his sister) in his arms. The little girl was caught in safety by the crowd, but Mr. Berlyn was less fortunate, he fell heavily on the pavement, and was taken up with both legs broken, and otherwise seriously injured. A female lodger jumped from the second-floor back room, on to some bales of rags in the yard, and escaped unhurt. Another female lodger precipitated herself from the first floor front window without injury, leaving her two boys, aged 8 and 16 years, in the back room, both of whom perished in the flames. No effort was made to obtain the parish fire-ladders, which stood within 20 yards of the burning house, nor was intelligence of the fire forwarded to any of the engine stations. The firemen were not apprised of the fire until it was seen reflected in the atmosphere, and by the time they reached the spot it had attained an alarming magnitude. Water being obtained, the engines were brought into action, but the ill-starred building with its contents was nearly destroyed, and six others seriously damaged before the fire could be wholly got under. About 6 o'clock the next morning the bodies of the unfortunate children were found in the ruins, burned in a shocking manner.

May 17, ½ A.M. Mr. Bryant, cooper, Broadwall, Lambeth. This fire commenced from some unknown cause in the workshops, which were constructed entirely of timber. The brigade engines from Waterloo-road,

and the West of England, were upon the spot in an incredibly short space of time. A plug on the Southwark main opposite the gate of Mr. Bryant's premises was drawn, but no water was forthcoming. Those of the Lambeth company were opened with no better success; but in about twenty minutes a supply was obtained from the latter, and the engines being set to work, the fire was extinguished; but by this time the workshops and their contents were nearly destroyed.

June 23, 1½ A.M. Mr. Rodgers, paper-mills, Berners-street, Commercial-road, East. These premises were very extensive, consisting of several large brick buildings, at the back of the houses in Berners-street, and extending into Back-church-lane. The fire was evidently the work of an incendiary, who had so well executed his diabolical purpose, that the flames broke forth all at once with awful violence. The engines from the brigade stations at Wellclose-square, and St. Mary Axe, with the County and West of England, were quickly on the spot, and water in abundance. After a desperate struggle, which lasted nearly two hours, the firemen accomplished their task, two-thirds of the mill being entirely destroyed, and the remainder seriously damaged.

July 24, 3 A.M. Messrs. Redding and Son, carmen, Castle-yard, Holland-street, Blackfriars-road. This fire seems to have arisen from a spark dropped in the wheelwright's shop. The flames had gained a considerable ascendancy before discovered, and illuminated the atmosphere for miles. The Southwark-bridge-road, Waterloo-road, and West of England engines, were promptly in attendance, and plugs were drawn both from the Lambeth and Southwark mains, but twenty minutes elapsed before water could be obtained from either. The consequence was, that the wheelwright's shop was consumed, and the stabling seriously damaged, before any effectual resistance could be offered to the flames.

August 6, 3½ A.M. Mr. Smith, corn merchant, the Wheatsheaf Granary, Upper Thames-street. This fire, which originated from the overheated flues of the steam-engine furnace, suddenly burst forth with a fury that threatened destruction to the several extensive buildings located on this spot. The Farringdon-street, West of England, Watling-street, and other engines arrived in rapid succession; and the tide being up at the time, an abundant supply of water was obtained both from the streets and the river. The floating fire-engine from Southwark-bridge, was brought alongside the burning pile, and assisted materially in stopping the progress of the fire, which, notwithstanding the strength opposed to it, burned furiously for nearly two hours. The flames had communicated to the adjoining granary of Messrs. West and Co., and to the front warehouse of Messrs. Rownson and Drew, but both of them were saved from destruction. Mr. Smith's waterside warehouse, the steam-engine, and about one-third of the landside warehouse were, however, destroyed.

October 4, 5 A.M. Mr. Anderson, black horse public house, Kent-street, Borough. This fire began in the lower part of the house from some unknown cause, and when discovered, had cut off the retreat of the inmates. Miss Anderson was lowered from a second floor window by three sheets tied together, which separated in her descent, but she was caught unhurt. Mr. Anderson and his two sons were rescued by the timely arrival of the fire-escape belonging to Bermondsey parish. The engines from Morgan's-lane, Southwark-bridge-road, and other stations, were soon on the spot, and though the Vauxhall and Southwark companies both have pipes laid down, upwards of half an hour elapsed before any water was obtained, and this was supplied by the Southwark main. The building upwards, with its contents, were, in consequence of the delay, nearly destroyed, but the stock in the cellars was saved.

November 12, 11½ A.M. Mr. Smellie, engraver and copper-plate printer, Bedford-court, Covent-garden. This fire was occasioned by an Arnott's stove in the front kitchen, which was used as a workshop. The fire burnt so rapidly, that some of the workmen had a narrow escape; a young girl was also rescued by Mr. Foggo, (the much respected foreman of the west-end district of the brigade) who brought her down a ladder from the first floor. The engines from the Chandos-street station, closely adjoining, were out and in operation in a very few minutes, but the apartment in which the fire commenced was destroyed, and the rest of the building damaged by heat and smoke; as well as by the water which some misguided workmen at a coach-maker's, next door, poured through the roof, the fire being at the time confined to the basement story.

November 15, 9½ A.M. Mr. Price, firework maker, Charles-street, Curtain-road. At the time stated, Mr. Price, a workman, and two lads, were engaged in their dangerous manufacture, the composition which they were using lying in exposed heaps on benches in the workshop, and an open fire burning in a grate in the apartment, a spark from which it is supposed flew out and ignited the composition. The materials exploded in succession with great violence, blowing out the windows and door. The two men and one of the boys rushed out into the street with their clothes burning; at the same time Mrs. Price, and her sister-in-law, threw

themselves out of the first floor window. The screams of the other poor boy from within the burning building being heard, some humane individuals rushed in and rescued him from the flames with which he was surrounded, but he had received such serious injuries, that he shortly after expired at the London Hospital. Within a very short space of time, several engines had arrived, and by the skilful exertions of the firemen, the flames were prevented from extending to the adjoining houses, but that of Mr. Price, with its contents, was all but destroyed.

December 1, 9 P.M. Mr. Reeve, boot and shoemaker, Princes-street, Soho. This fire, which broke out from some undiscovered cause, burned with such rapidity, that, notwithstanding the early hour at which it occurred, it had nearly terminated fatally to one of the inmates. It appears that Mr. J. Millard, aged sixty-five years, and his wife, who occupied the third floor, finding their escape by the lower part of the house completely cut off, proceeded through a trap-door on to the roof. Unfortunately, Mr. Reeve's house was about 16 feet higher than those adjoining, and Mrs. Millard dropped on to the next house by means of her husband's cloak, but the infirmities of age prevented him from following her. The fire-escape belonging to the St. James's local society for the protection of life from fire, was soon on the spot, and Mr. Millard was taken off the roof of the burning building unhurt. The following letter was addressed to the Committee of Management of the Society :—

"J. Millard, occupant of the third floor in the house of Mr. Reeve, Princes-street, Soho, boot and shoemaker, burned on Wednesday night the 1st of December, begs to recommend David Clark to the committee, to whom he is indebted for kindly and humanely, at the hazard of his own life, rescuing the said J. Millard from the burning house."

At the society's next meeting, they unanimously voted two pounds to each of the conductors (Dupere and Clark,) for their exertions at this fire.

The prompt arrival of the firemen and engines from the Chandos-street, Crown-street, and other stations, with a plentiful supply of water, led to the early suppression of the fire. But the back part of the house, from the first floor upwards, and the roof, were destroyed.

I have particularised these fires as so many instances of the splendid effects resulting from a well-organised and harmonious system of co-operation; providing, as it does, for the earliest arrival of a force adequate to almost every emergency, in combination with a degree of practical skill and discipline certainly never surpassed. Justice, however, requires me to add, that in the far greater number of minor accidents, of which my limited space forbids the enumeration, and in which but trifling damage has been sustained, still stronger proofs of the practical results of this system are to be found.

The proportions which the *slightly damaged* bear to the whole number of fires is such as cannot fail to reflect great credit upon the servants of the establishment, whose prompt attendance on timely applications being made to them, and the skilful manner in which many of the accidents have been dealt with, have, upon many occasions, confined the damage to a surprisingly narrow limit. So far as the public are concerned, it happens, that the greater number of cases in which the well-judged efforts of the firemen are pre-eminently successful, are unknown, and therefore unappreciated, beyond the limits of their immediate locality.

The following list exhibits the occupancy of the various premises in which the fires have originated; discriminating, as heretofore, between those which began in that portion of the building appertaining to the trade of the occupant, from those which have happened in, and damaged the dwelling-houses only :—

Apothecaries	1
Asphalte works	1
Bagnios	3
Bakers	18
Barge and boat builders	1
Basket makers	2
Beer shops	4
Booksellers, binders and stationers	14
Bottle merchants	1
Brokers and clothes salesmen	3
Builders	1
Cabinet makers	16
Carpenters and workers in wood	37
Chandlers	17
Charcoal and coke dealers	1
Cheesemongers	3
Chemical manufactories	8
Churches	3
Coachmakers	4
Coffee and chop-houses	4
Coffee roasters	1
Confectioners and pastry cooks	2
Coopers	1
Cork burners	1
Carried forward	147

Brought forward	147
Cotton wick manufacturers	1
Curriers and leather dressers	4
Distillers	2
Drapers	21
Drysalters	1
Dyers	1
Eating-houses	5
Farming stock	4
Firework-makers	2
Flax dressers	1
Floor cloth manufacturers	1
Furriers and skin dyers	3
Gas works	1
Glass blowers (illicit)	1
Granaries	1
Grocers	6
Hat makers	6
Horse hair merchants	2
Hotels and club-houses	6
Japanners	1
Lamp black makers	1
Laundresses	5
Leather (patent) manufacturers	1
Lime wharfs	1
Lodgings	61
Lucifer match makers	11
Malsters	1
Manchester warehouses	2
Marine stores, dealers in	5
Mattress makers	2
Mills, steam	4
Musical instrument makers	1
Naphtha manufacturers	1
Oil works	2
Oil and colour shops	10
Painted baize manufacturers	1
Panoramas	2
Carried forward	328

Brought forward	328
Paper mills	1
Pawnbrokers	3
Printers and engravers	2
Printers, copper-plate	1
Private dwellings	213
Public buildings	6
Rag merchants	1
Railways	1
Rope makers	1
Sack makers	1
Saw mills, steam	3
Schools of industry	2
Shops and offices	25
Shot manufacturers	1
Ships	7
Ship builders	1
Soot merchants	1
Stables	14
Steam boats	2
Steam-engine makers	2
Straw-bonnet makers	1
Sugar refiners	1
Tailors	4
Tallow chandlers and melters	1
Tanners	1
Tar distillers	1
Theatres	4
Tinmen, braziers, and smiths	4
Tobacco manufacturers	1
Tobacconists	4
Under repair and building	2
Unoccupied	6
Upholsterers	4
Victuallers	34
Wadding manufacturers	2
Warehouses	3
Wine and spirit merchants	7
	696

The number of fires on each day of the week was as follows :—

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
109	103	94	80	107	101	102

Their hourly distribution throughout the day and night has been as follows :—

	First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
A.M.	35	38	24	21	19	14	7	20	14	19	14	24
P.M.	16	27	16	16	21	26	47	42	79	59	60	38

A careful and elaborate investigation into the causes of these fires gives the following result; and it is to be regretted that the numbers known to have been wilful, and others that occurred under very suspicious circumstances, are so great.

There have been occasioned by—

Accidents of various kinds, ascertained to have been for the most part unavoidable	24
Apparel ignited on the person (2 fatal)	5
Candles, various accidents from	72
Ditto, setting fire to bed-curtains (8 fatal)	76
Ditto, window-curtains	36
Carelessness, palpable instances of	25
Children playing with candles	3
Ditto, fire (1 fatal)	9
Ditto, lucifers	6
Fires, sparks from	13
Ditto kindled on hearths and in other improper places	
Fire-heat, various applications of, to hazardous manufactures	
Fireworks, making of (1 fatal)	
Ditto, letting off	
Flues, defective	
Ditto, foul	
Ditto, overheated	
Ditto, stopped up	
Friction of machinery	
Fumigation, incautious	
Furnaces, overheated, &c.	
Gas, various accidents from the escape of (1 fatal)	
Ditto, carelessness in lighting	
Ditto, left burning	
Illumination	
Intoxication (1 fatal)	
Lamps, sparks from, &c.	
Lightning	
Lime, heating of	
Linen, airing of	
Lucifer matches, making	
Ditto, using	
Ovens, defective, overheated, &c.	
Reading and sewing in bed (1 fatal)	
Shavings, loose, ignited	
Spontaneous ignition of coals	
cotton	
flax	
hay	
lamp-black	
phosphorus	
rags, damp	
ditto, oily (1 fatal)	
rubbish	1
shoddy	1
tan	1
wool	1
Stoves, defective, overheated, &c.	30
drying	6
portable	3
pipe	10
hot air	2
	3
Suspicious (1 fatal)	7
Carried forward	638

Brought forward	638
Tobacco-smoking	22
Wilful	13
	673
Undiscovered* (4 fatal)	23
	696

In a lecture recently delivered at the Royal Adelaide Gallery, by Mr. Booth, F.S.S., on the fires of London, their causes and prevention, he stated that in a period of five years there were in London no less than 2476 fires. These he divided, as regards their causes, into three classes, controllable, partly controllable, and partly uncontrollable, and after expatiating upon these classes, the lecturer proceeded to observe that, notwithstanding all the vigilance of inquiry that was adopted, there remained a large number of instances in which the causes were unassigned. These he endeavoured to ascribe to spontaneous combustion, observing that certain chemical combinations would take place in bodies, by which heat was elicited sufficient to ignite the bodies themselves, or any substance with which it might be in contact. The series of circumstances under which this took place, was of a very important character, and sufficed to explain many fires of mysterious origin; and what confirmed this view of the case was, that many of the unknown fires originated in those trades in which substances were employed, in which spontaneous combustion was likely to take place. Mr. Booth enumerated fifty-five instances in which spontaneous ignition might ensue, many of which are well known, others of questionable authenticity. He then alluded to the occurrence of fires from very singular causes; amongst these were fires proved to have been produced by transparent substances, acting as lenses, and concentrating the rays of the sun; such as glass globes with gold fish, show-bottles in apothecaries' and chemists' shops, and water bottles in bed-chambers, which had each been known to ignite bed and window curtains. Coarse and blistered glass, used in sky-lights, had caused explosions in gunpowder manufactories; as had also lime, when used in the desiccation of that substance. Lime had likewise, by accidental flooding set fire to many buildings where it

* In thirteen instances, the firemen were not admitted into the premises, and therefore could not obtain any particulars.

was in contact with combustible substances. Under friction, Mr. Booth alluded to the danger of fire occurring from congreve matches, stating that they were liable to ignite after they had been thrown away as useless; the inflammable material was also frequently thrown aside to a considerable distance, and might be productive of great mischief. On these accounts, their use should be prohibited in warehouses and manufactories where combustible matters are kept or used. Amongst the causes of mysterious fires, might also be enumerated the embers of tobacco and cigars, which falling upon saw-dust, or being carried to hay-ricks, would prove their destruction, even after some time had elapsed, as they acted like touchwood, from the nitre which they contained.

Having entered thus minutely into a series of circumstances, little understood, and less guarded against, the lecturer stated, that by attention to the published causes of fire, great good would be accomplished. The number of fires continually occurring from overheated flues and stoves particularly demanded attention. The flues of buildings which had been constructed for heating merely by the simple combustion of wood or coal burned in open fire-grates, are not at all fitted to be exposed to the intense heat given off by several of the modern stoves. The great principle of these modern contrivances was to obtain and diffuse as large a proportion of heat from as small a surface as possible, and with the least consumption of fuel; and one of the means, was limiting the draught of air. The air thus concentrated attains a very high degree of temperature, sufficient to ignite any combustible substances with which it may come in contact; besides which, the conductile power for heat of bricks and plaster becomes much modified by being constantly subjected to its influence. In this, Mr. Booth considers lies the great secret of the destruction of many modern public buildings; and the inquiry is of much public importance, because the causes of destruction may, even now, be in slow and insidious operation to the eventual destruction of other national, and particularly sacred edifices, from the general introduction of new fashioned stoves into such buildings. It was also, he remarked, notorious that there existed means of making buildings *fire-proof*, so that when a fire occurred, it might be confined to the apartment in which it originated.

Of the sixteen fatal fires, the following seem to require especial notice, attended as some of them have been by circumstances most distressing to the feelings of humanity, and most disgraceful to the police on duty in the several localities, who have shown a neglect and want of tact almost incredible.

The first of these fatal fires was that at Mr. Freeman's, in Parson's-street, Upper East Smithfield, 1½ A.M., on the 10th of March, when a female perished, as before noticed. A coroner's inquest being held upon the body, the following verdict was returned:—"That the deceased, Ann Dillon, was burned to death at a fire that took place on the morning of the 10th of March, but whether it originated by accident, or otherwise, there was no evidence to show."

May 3, 11½ P.M. Mr. Berlyn, dealer in marine stores, Church-lane, Whitechapel. The bodies of the two children, Abraham Weller, and Edward Weller, were found after the fire was extinguished, at the back part of the ruins, burnt in a most frightful manner. A coroner's inquest was held the same evening, and after a lengthened and unsatisfactory investigation, a verdict of accidental death was returned.

June 8, 4½ A.M. Astley's Amphitheatre, Westminster-bridge-road. Mr. Ducrow having been roused to a sense of his danger, he instantly collected his family and servants, and escaped with them in their night clothes: they first ran down stairs to the entrance leading to Westminster-bridge-road, but being unable to open that door, they retraced their steps, and descended a back staircase, amid clouds of dust and smoke, into the court-yard leading into Stangate-street. One of the female servants, named Elizabeth Britton, who had lived with Mr. Ducrow for many years, and to whom he was much attached, after escaping, was so imprudent as to return, under a vain hope of saving (as is supposed) her clothes, and was never again seen alive. After the fire was over, her blackened remains were found in a crouching position behind the door of the box entrance. The coroner's inquest returned a verdict that the deceased, Elizabeth Britton, was accidentally burned to death by going into Astley's Theatre, which had taken fire by accident." The loss of his property, and the melancholy death of his beloved servant, had such an effect upon Mr. Ducrow, that he never recovered the shock; his health fluctuated greatly, till February, 1842, when he suddenly expired.

July 2, 11 P.M. Mr. Reilly, chair-maker, Quickett-row, New-road, Marylebone.

This fire was supposed to have been occasioned by one of Mr. Reilly's workmen, who lodged in the house, and returned home about 11 o'clock in a state of intoxication. He retired to his room, from which he never came forth alive, but perished in the funeral pyre he had unwittingly kindled, dying a most dreadful "drunkard's death."

October 11, 3¾ A.M. Mr. Merry, cheesemonger, High-street, Newington-butts. At the coroner's inquest on the bodies of the two sufferers, Mrs. Merry, and the maid-servant, Police constable 198 P said, "*If I had known that the ladders were nearly opposite the fire, where I have since seen them, I think the old lady's life could have been saved!*" Another policeman, 246 P, stated that, "*when he entered the police force, he was not told where the fire-escapes were placed!*"

It is a fact, that the parish ladders stand nearly opposite to the ill-fated building, and the spot is indicated by an inscription in legible characters stating where the keys are to be obtained. How ignorance of the circumstance could possibly be pleaded, seems passing strange. The parish engine from the same spot was soon brought out, for the sake of the reward; but there was no person present competent to set it to work, and the bringers were too much ashamed to apply for the reward, which was given to the West of England, the next to arrive, and the first to work on the fire. The jury returned a verdict of "Accidental death," at the same time expressing their regret "that the police were not acquainted with the place in which the parish ladders were kept, as they might have prevented the sacrifice of human life." It was also determined to memorialize the commissioners on the subject.

Three fires, as already narrated, proved fatal to firemen; one terminated fatally from a sudden explosion of gunpowder; four were fatal to children from the ignition of the beds on which they lay; and three from the ignition of wearing apparel on the person.

The most extraordinary case of burning that ever came within my knowledge, is set forth in the following narrative from the Weekly Dispatch of May 9th last, which proves

"——— how frail we are,
How short our life, and how uncertain
The means that bring us to our end!"

"SINGULAR CASE OF BURNING.—On Monday, an inquest was held at the Ormond's Head, Princes-street, Storey's-gate, Westminster, before Mr. Higgs, Coroner, on the body of Charlotte Furneaux, aged 16 months, whose death occurred under the following circumstances:—Frances Furneaux, sister to the deceased, stated that on Saturday morning she and the deceased were out walking in Tufton-street, when suddenly the upper part of her clothes burst out in flames. Witness cried out for help, and several people immediately came to the deceased's assistance. Deceased had no combustibles in her hand or about her dress, nor was there any one near who could have set her clothes on fire. Thos. Parry, of No. 12, Chandos-street, coach-painter, stated that he was at work on the morning in question, at No. 57, Tufton-street, and hearing screams he looked out of the window and saw deceased in the street in flames. He and other persons from the neighbouring houses rushed out and extinguished them by throwing carpets, &c., round deceased. She was most dreadfully burnt, and he instantly conveyed her to the Westminster Hospital. There was no one near who could set fire to her clothing. She had on a black pinafore, but there was nothing at all remarkable about the other materials of her dress. C. H. Garstin, Esq., house-surgeon to the Westminster Hospital, stated that deceased was burnt in a most horrible manner, and it was utterly impossible that any medical skill could have saved her life. She died in great agony on the following morning. The jury returned a verdict of 'Death by burning,' there being no evidence to show how the combustion of deceased's apparel had originated."

In my last report, I noticed the formation, in June, 1840, of a local society for the protection of life from fire in the parish of St. James's, Westminster, in consequence of the sad calamity which had then recently occurred by the loss of two lives at a fire in Marylebone-street. This society (all the officers of which, including their indefatigable secretary, Mr. W. J. Newton, are honorary) has been in full operation during the last eighteen months, with the most gratifying success.

The principal fire-escape of the society (one of Wivell's) is deposited during the day in Argyll-place, and every night, at half-past eight o'clock, is placed in charge of the conductor, on the south side of

Golden-square, prepared to proceed, at a moment's notice, to any part of the parish or its vicinity where a fire may break out. The conductor, with his escape, has been in attendance, during his hours of duty, at thirty-three fires; twenty of which have occurred in St. James's, and thirteen in adjoining parishes.

At eleven of these fires he arrived several minutes before the turncock or engines; and in fourteen instances he arrived simultaneously with the first engine. In three instances he succeeded in extinguishing the fires before any other assistance arrived; and, upon one of these occasions, he was presented with a *sovereign* as a reward for his prompt and efficient services, by the British Fire Office, who had an insurance upon the premises. At one fire (Mr. Reeves', in Princes-street), the society's servants succeeded in saving the life of a fellow-creature, as already noticed; and the society have the gratification of knowing that no loss of life by fire has occurred within their district, since they commenced operations. In addition to the escape above alluded to, the society have stationed a sliding ladder escape at the south end of the Burlington Arcade, as well as two portable rope escapes, one at the workhouse entrance, No. 50, Poland-street, the other at the residence of the collector, No. 41, Brewer-street, Golden-square.

In my last report, I alluded to the sensation which had been produced in the city by the occurrence of some fatal fires attended with a serious loss of life, under circumstances most disgraceful to the authorities. I also described in detail the measures which had been taken, up to that period, with a view to prevent a repetition of such calamities. I have now only to bring down the narrative to the present time. On the 24th February, the Police Committee, with D. W. Harvey, Esq., the Police Commissioner, and Mr. Braidwood, the Superintendent of the London Fire Establishment, met at Guildhall to receive and inspect the very excellent fire-escapes which had been made agreeably to their order; a notice of which meeting duly appeared in your 916th Number.

After these escapes had been examined and admired, they were deposited in a dark damp hole at the back of Guildhall, known as the "kitchen," where they have remained ever since, rapidly undergoing the decay that appertains to all sublunary things.

I have only to add the fact, that the makers' bills have been paid, and so ends

"This strange eventful history."

During the past year the deficiencies of the water supply have again been most seriously felt in several localities, especially in the neighbourhood of Bermondsey, where a timely or adequate supply can scarcely ever be relied on. In several other districts, however, similar misfortunes have likewise been experienced, and the whole question is now before Her Majesty's government, in order to ascertain if this highly important matter will not admit of some systematic improvement, by which a prompt and sufficient supply of water may be insured upon every occasion of fire.

In my last report I mentioned that an improved marine fire-engine was building for the Emperor of Russia, by Mr. Merryweather. During the past summer this magnificent machine has been completed, and now floats on the waters of the Neva, affording the protection of its immense power, in case of fire, to St. Petersburgh and its environs.

Fig. 1, (see front page) is a side elevation of this marine fire-engine, from a drawing taken at St. Petersburgh; and fig. 2 is a ground plan of the boat and machinery. It consists of a fine iron boat, 60 feet long, and 16 feet wide, constructed by Messrs. Fairbairn and Co., of Blackwall. The engine has three working barrels, A, 7½ inches in diameter, with a 14½ inch stroke. Manual power is applied to four cranked handles, H, 12 feet long, and 18 inches radius, which are connected by toothed gearing with a main shaft, C, carrying three 6-inch cranks. Connecting-rods, *d*, pass up from these cranks to three over-head levers, E, the fulcra of which are placed in the back part of the frame, behind the air-vessel, B: the other end of the levers being attached to the piston-rod slings. Each pair of the cranked handles is provided with a fly-wheel, W, 6 feet in diameter, to equalize the motion, and the handles, H, are all fixed at angles of 90° relatively to each other.

The engine occupies the middle of the boat, both ends of which are alike, to su-

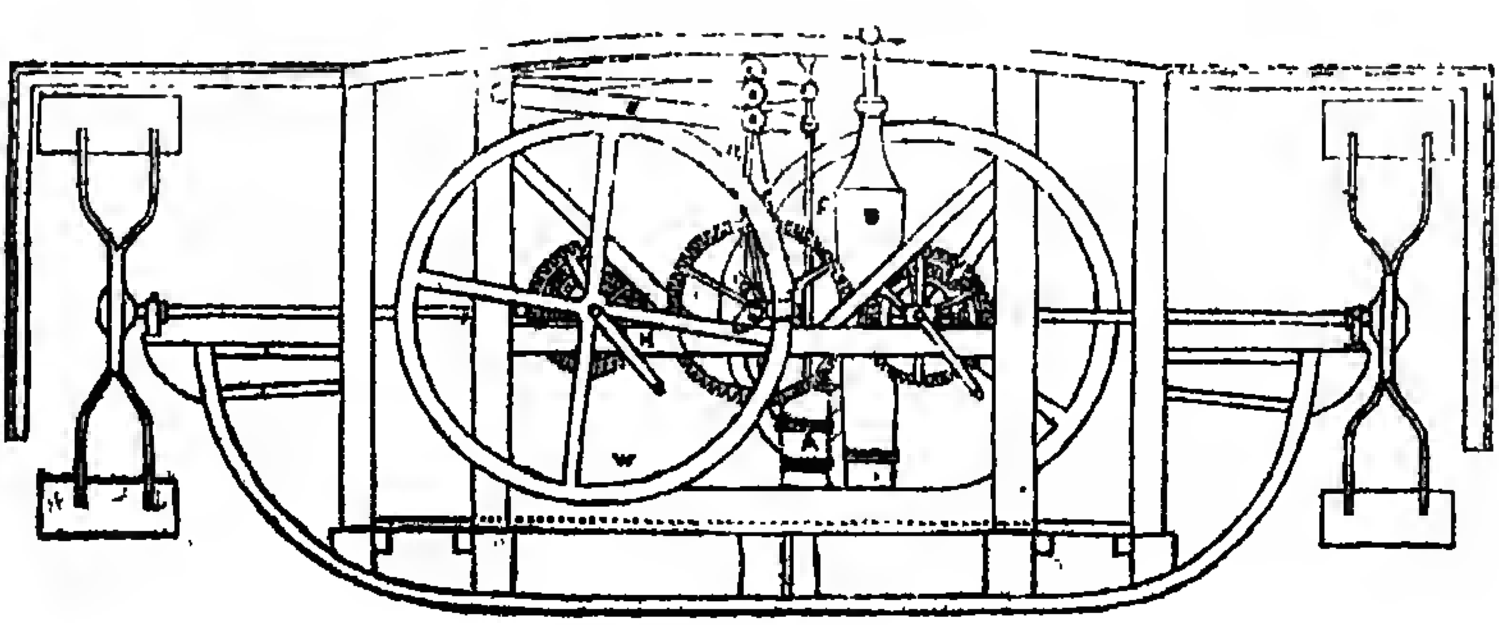
persede the necessity of turning round: and about mid-ships are placed two paddle-wheels, P, the paddle-shaft, carrying bevelled wheels, to admit of its being connected by sliding-gear with the cranked handles, when they are disconnected from the pumps.

The prefixed engraving is a side elevation of the engine, showing the situation and arrangement of the cranks, levers, &c.

A, is one of the three working barrels, all of which deliver their contents into the air-vessel, B. C is the main crank-shaft from which the connecting-rod, *d*, passes up to the over-head lever, E. F is the piston-sling, the piston-rod working in a guide fixed on the top of the cylinder, A. On the upper part of the air-vessel, B, there is a revolving T-piece, carrying two male-screwed nosels, to which two separate lines of leather hose may be attached, or, if it is preferred to work but one more powerful jet, the second orifice is closed by a screwed cap. When a single stream is delivered, the jet may be 1 inch, $1\frac{1}{8}$, $1\frac{1}{4}$, or $1\frac{3}{8}$ inches in diameter, according to the elevation required, with a nose-pipe $1\frac{1}{8}$ inches in diameter; the height reached is about 120 feet, or 136 feet horizontal. If two jets are employed, nose-pipes $\frac{7}{8}$ths of an inch in diameter are used.

The working of the pumps, levers, &c. is exceedingly smooth and steady —that of the toothed gearing remarkably so; there is no shake or rattle in any part of the machinery, and the presence of toothed gearing cannot be detected by the ear. The streams of water are beautifully compact and steady, and capable of being directed with great precision.

From the circumstance of some mis-



calculations having been made, with respect to the propulsion of the boat, either by underrating the power, or overrating the resistance, the speed at first attained was by no means satisfactory, being little more than six miles per hour; but the manual power was so greatly in excess, that when paddles of a proper size have been fitted, there is no doubt that a speed of upwards of eight miles an hour will be realized, without any particular exertion on the part of the "rowers." The rapidity and ease with which the power of the men could be transferred from the *paddles* to the *engines*, and *vice versa*, greatly astonished all who saw it.

The signals, "ease her," "stop her," the shifting of the gearing, and the order to "go on," have been frequently completed within one minute.

The Sovereigns of Prussia and of Russia have now, the one the finest *steam fire-engine*, the other the finest *marine fire-engine* in the world.

The exertions of the West of England firemen, under their excellent foreman, Mr. Connerton, continue to merit especial notice. The promptitude of their attendance may be very well illustrated by mentioning that, in upwards of fifty instances, they have shared the rewards for early arrival, which are only allotted to the first three engines —including among these, their attendance at Camberwell (twice,) Deptford, Greenwich, Blackheath, Islington, Hammersmith, and

other distant places. Their zeal and activity in getting to work, on arriving at a fire, have been fully equal to their expedition in reaching it; and there have been few fires of any magnitude in the metropolis, at which the West of England firemen have not borne a conspicuous part, and greatly distinguished themselves. The West of England Company are particularly fortunate in their servants, as their good success is by no means confined to the metropolis. At Exeter, Glasgow, and in many provincial towns, their achievements have called forth the warmest eulogiums of the public press. Upon the occasion of a recent fire at the extensive cotton spinning works of Messrs. Bartholomew and Co., at Barrowfield, near Glasgow, the West of England men won "golden opinions from all sorts of people." These extensive works were discovered to be on fire shortly before three o'clock A.M., on the 23rd of November last. Information was immediately sent to the Fire Police of Glasgow, but from the preremptory orders given to Mr. Robertson, the superintendent of the Fire Establishment, by the Glasgow Police Board, "that he was not on any pretence whatever, to go himself, or allow his men or engines to be sent, beyond the bounds of the Royalty;" he could not move in the matter. No sooner was the alarm of fire received in Glasgow, however, than the splendid engine of the West of England Office and their fire brigade, proceeded to the spot as fast as horses could take them, and rendered the first and most efficient assistance. The *Glasgow Constitutional* remarks that, "the rapidity with which the engine of the West of England Company was brought forward, the activity, industry, perseverance, and fearlessness of the brigade attached to it, merit the approbation of all concerned; and though no part of the building or stock was insured with that office, Mr. Wardlaw, the agent, was present during the whole period, lending every assistance in his power."

The West of England engine was followed by that of the Anderston police, others from the city, and one from the cavalry barracks most admirably manned by a party of artillerymen. These were subsequently reinforced by the two engines of the Glasgow Fire Police, which the Lord Provost eventually forwarded on his own responsibility.

The paper already quoted, commenting on the refusal of the Glasgow Police Board to send out their engines when a fire is raging, destroying thousands of pounds' worth of property, and throwing hundreds of work people into a state of starvation, observes "They are not required—no one has ever required them—to send their engines beyond the police boundaries for nothing. The very Act of Parliament which places the fire department under their control, gives them undoubted powers to recover the expense incurred in extinguishing fire beyond the Royalty; and yet, with this guarantee, with the additional guarantee of the proprietors, and the official and personal guarantee of the Lord Provost to back it—with a recklessness of life and property, *unequalled, we may safely say, in any civilised society*, they direct their superintendent to refuse assistance, whatever may be the obvious destruction to follow from their dogged and unjustifiable conduct!"

The year just ended has been one of great fatality to the firemen. The first victim to the perils of his calling was M. West, aged 33, a fireman of the County Fire Office, who was killed by the falling of part of the house of Mr. Salmon, in Piccadilly on the 12th of September, as already described. West was a most skilful and intrepid fireman, and had, on many occasions, particularly distinguished himself; his exertions at the House of Lords, at Hatfield-house, and elsewhere, have been duly recorded in your pages. The day of his death was also the anniversary of his birth, and West had been unusually low-spirited and melancholy throughout; whether from a presentiment of some approaching calamity, or from the meditations which the return of his natal day suggested, is known only to Him "from whom no secrets are hid." West's wife, who was near her confinement, had a strong presentiment of her loss, declaring in the morning, when he did not return with the other firemen, "that she had seen him at her bedside in the course of the night, and that she was confident he was no more."

On the Thursday following, the remains of West were deposited in the cemetery established by the late Barber Beaumont, Esq., (the founder of the County Fire Office) at Mile-end.

The burial service was read by the Rev.

Dr. Croxton, who, after its conclusion, delivered an impressive and eloquent address to the firemen present, touching upon the excellent character which the deceased had maintained, as an example to them, and also on the arduous duties which firemen generally have to perform; earnestly exhorting them to prepare for a future world, none of them knowing how soon they might, like their late companion, be called into eternity.

Mr. Beaumont, the present owner of the Cemetery, gave the ground. The expenses of the funeral, and of a tablet to be erected to the memory of the deceased will be defrayed by the County Fire Office, by which, also, an annuity, with a residence, have been provided for the widow.

In little more than a month afterwards, viz., on the 31st of October, Richard Wivill, (aged 23) a junior fireman in the London Fire Establishment, was killed in the discharge of his duty at the Tower, as already narrated. Wivill was a good, though young fireman, and bore a most exemplary character; he was unmarried, and was the principal support of an aged mother. His remains were buried on the Sunday following that on which he died, at St. Saviour's, Southwark, with all the honours that admiration of his conduct and sympathy for his melancholy fate could suggest.

On Sunday, the 14th of November, Joseph Parkes, aged 25, and William Webb, aged 24, fell victims to their own imprudence and disobedience, at the fire, which destroyed Messrs. Kindon's floor-cloth manufactory, in Blackfriars-road, the particulars of which are before recorded.

It is painful to reflect, that in each of these cases the heat of the battle was over, the victory completed, and all occasion for exposure to danger removed.

On the following Sunday, the remains of the two unfortunate men were interred in one grave, at St. George's, Southwark, with the same honours as they had assisted to pay their deceased comrade only a fortnight before.

The bereft mother of Wivill received a donation of 20*l.* from the Board of Ordnance—6*l.* from the officers of the Scots Fusileer Guards, per Col. Eden—and 1*l.* from Mr. Robarts, the Banker. The widow of Parkes received a donation of 25*l.* from the Committee of Management of the London Fire Establishment, and Webb's widow a similar sum; in addition to which, Mrs. Webb also received upwards of 6*l.* subscribed for her by the constables of the M division of police, as well as other sums from private sources.

The London Fire Establishment, (managers and men) are also straining every nerve to get Webb's infant son (two years old) into the Infant Orphan Asylum at the forthcoming election in April; and it is most sincerely to be hoped, that their benevolent efforts will be crowned with well-deserved success; when that is done, it is understood the child's board, from the time of the accident till its admission into the asylum, will be reimbursed by the Establishment.

It is also right to mention, that every expense incident to the three funerals, including mourning, has been defrayed by the Committee of Management of the London Fire Establishment.

All the machinery of the Establishment continues in excellent order, and the efficiency of the men, from Mr. Braidwood, the superintendent, to the last junior fireman, continues to promise the utmost protection that bravery and skill can accomplish.

There are among them, those, who, under the protection of an all-wise and overruling Providence, have grown hoary in this perilous calling; may His omnipotent arm still watch over and protect them, amidst every danger, is the sincere prayer of

Sir, your obedient servant,
William Baddeley.

29, Alfred-street, Islington,
February 21, 1842.

NATURAL LINEAR STANDARD.

Sir,—May I request you will submit to the judgment of your more learned readers the following—

Proposition:

The steel-yard with arms as 1 to 4, being retained in equilibrio by weights which are as 4 to 1, is balanced, also, by a body one-fourth the less weight let fall on the end of the longer arm when its momentum has quadrupled its own weight. The length of the fall is a fixed quantity, and always obtainable under equally proportional circumstances.

Fig. 1

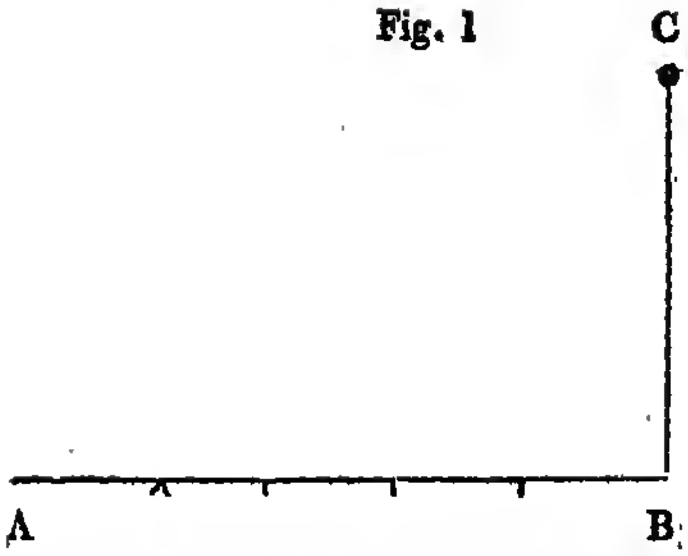


Fig. 2.

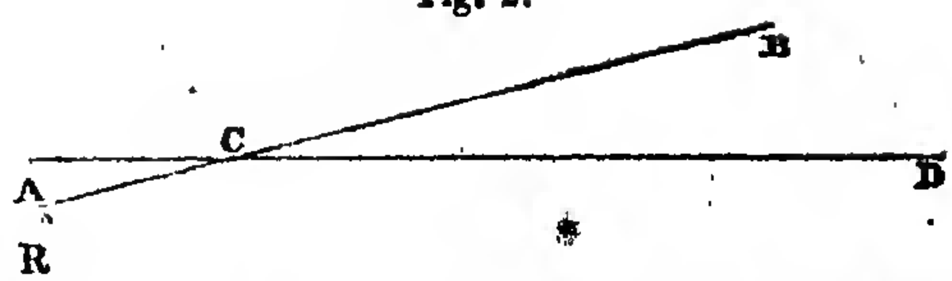


Fig. 1, A, a body of unknown weight. B, one-fourth of A; C, one-fourth of B; C + its momentum at B = B the counter balance of A. The length of descent C B gives the standard of linear measure.

Fig. 2, Adjustment of the beam for practical proof. A, the greater weight, R a rest; B C D angle of elevation.

One-fourth of C B for commercial linear measure.

One-fourth of C B the side of a cube for liquid measure.

One-fourth the weight of the full contents of the cubical measure of distilled water for scale weight.

T. Pasley.

Jersey, January 31, 1842.

LAW OF WHEELS.

At the Birmingham Public Office a case of considerable Importance to carriers and toll collectors lately came on for hearing before J. T. Lawrence, Esq., and Dr. Melson. It was a complaint by Mr. Robert Howson, agent to Messrs. Pickford and Co., the extensive carriers, against John White, late toll keeper of Spark Brook turnpike, for demanding and taking from Daniel Camden, one of Messrs. Pickford & Co's. wagoners, £5 more toll than was authorised by the act. The wagoner refused to pay the defendent's demand, and the latter seized one of the horses, which he afterwards sold, appropriating the money in payment of his claim.... Mr. George Edmonds appeared for Messrs. Pickford, and said, that on the 26th ult., two caravans, constructed with springs, and loaded with goods, went through the turnpike gate at Spark Brook. They were taken over the machine and were found to be over weight. The only question, however, was, not as to the weight of the wagons, for this was agreed to on both sides, but as to the amount of over weight which the act allowed to vehicles of this description. The defendant alleged that 3 tons 5 cwt. was all that they were entitled to carry, and the complainants, on the other hand, contended that they were entitled to 3 tons 15 cwt., being 10 cwt. more. For this weight Messrs. Pickford had tendered the proper amount of toll, and all that they required the magistrates to decide was, which of the parties were right in their construction of the act. Mr. Edmonds then proceeded to direct the attention of the magistrates to the acts of parliament regulating the amount of goods to be carried by certain descriptions of wagons. The 3rd Geo. IV., c. 126, sec. 12, created a graduated scale of weights to be allowed in summer and winter respectively to two classes of carriages therein mentioned; the first of which he should designate as "broad wheels," or such as had wheels of the width of 4½ inches and upwards, and the second he should call "narrow wheels," or such wheels as were under 4½ Inches. The weight allowed to be carried by the first description of carriages was 3 tons 15 cwt., and upwards, and for the second class 3 tons 5 cwt. The carriages spoken of in the 12th section were called wagons, wains, and other four-wheeled carriages, but in the 13th section a new class of carriages was introduced, which, in order to distinguish them from the former description of carriages, were called "caravans or other four-wheeled carriages for the conveyance of goods, and built and constructed with springs," and to those carriages 3 tons 15 cwt. was allowed in winter, without reference to the width of the wheels. Upon these two sections alone it was admitted that the carriages in question came within the latter description, (the 13th section,) and would be entitled to carry 3 tons, 15 cwt.; but an act 3 and 4 Wm. IV., c. 81, was passed, which, as was contended by the toll collector, repealed the privilege of the extra 10 cwt. allowed to spring carriages, and put them under the 12th section, in the same class as common wagons. The act 3 and 4 Wm. IV., after reciting the two sections of the 3rd Geo IV., already mentioned, and stating also that doubts had arisen whether the 13th section (that allowing to all spring

carriages a fixed weight of 3 tons 15 cwt. without reference to the width of the wheels) might not extend to all wagons, &c., if on springs, although if not on springs they would be comprehended under the other section, and might be allowed a graduated weight up to 6 tons—then enacted that the said 13th section of Geo. IV. "should not extend to wagons, &c., having the felloes of the wheels thereof of the breadth of not less than 4½ inches at the bottom or sole thereof, notwithstanding the same may be built and constructed with springs." Mr. Edmonds contended that this clause did not apply at all to wheels of less than 4½ inches but left them entirely under the 3rd Geo. IV. the act of William applied to wagons of not less than 4½ inches; that was, of a width of 4½ inches "or more, and which would come under the designation of "broad wheels." Supposing, for instance, a spring carriage to have wheels of 9 inches in width, under the 12th section of Geo. IV. such carriage would be allowed 6 tons, but if placed under the 13th section it would only be allowed 3 tons 15 cwt. The act of William therefore declared that the 13th section should not apply to the broad-wheeled spring carriages, but that they should be entitled to the extra weight allowed by the 12th section .... The description of the caravan, and the width of the wheels, with the weight of goods carried, were proved by Camden, the wagoner; and Mr. Howson also deposed to having tendered to the defendant the amount of toll to which he considered him legally entitled, before the horse was sold, and which he refused to accept. The magistrates having consulted for a few minutes, Dr. Melson said that the 13th section clearly entitled the complainants to the extra 10 cwt. The ambiguity in the act of Wm. IV. appeared to him to arise from the introduction of the second negative in the sentence already quoted, namely, "should not extend to wagons, &c., having the felloes of the wheels thereof of the breadth of *not less* than 4½ inches," &c. If the word "more" had been substituted for the words "not less," the meaning intended would be more clearly expressed, viz., that the clause allowing the fixed weight of 3 tons 15 cwt. should not extend to wheels of more than 4½ inches, or "broad wheels." The wheels in the present case being "narrow wheels," the weight was entirely regulated by the 13th section of the 3rd Geo. IV., and the 4th William IV. did not apply to them.—The defendant said that himself and his fraternity had always read the act differently, and had so acted upon it. —The magistrates ordered the defendant to refund the overcharge, amounting to 5*l*., and to pay, in addition, the expenses and loss incurred by Messrs. Pickford, in the detention and keep of the horses while in his custody, amounting to 2*l*. 13*s*.—Mr. Edmonds then applied for the infliction of a penalty which the act left at the discretion of the magistrates. He did not wish for any heavy fine, but as the Messrs. Pickford were not required to pay in similar cases on any other road they travelled, he thought that some trifling penalty was necessary, in order to mark the magistrates' opinion of the case.—The defendant pleaded his inability to pay, and also exemption under a clause in the act.—The complainant ultimately agreed not to press for a penalty, upon the understanding that every matter relating to the question should be considered as settled by the decision of the magistrates. To this proposition the defendant agreed; and Dr. Melson said, if a similar case again arose, the magistrates should certainly inflict the full penalty of 5*l*.—*Midland Counties Herald.*

ON THE CAUSES OF INJURY TO BOILERS. BY C. W. WILLIAMS, ESQ.

Sir,—In following up the subject of the conduction of heat through metallic plates and bars, my object is to show how intimately connected are the scientific details of the subject, with the amount of evaporation effected, or of injury sustained, by a judicious application on the one hand, or any derangement on the other, of their conducting powers. That the causes of such injuries have not been sufficiently inquired into, is evident from the unsettled state of the question, and the absurd and contradictory causes to which even some practical men attribute them. Among many instances, I may mention the following. In one case, a boiler was seriously injured, and the premises set on fire, by the overheating of the plates, even to redness, in consequence of an accumulation of deposit within (above four inches thick), and which, after an interval of rest, had become consolidated on the bottom, as described in my former communications. This indurated mass being a bad recipient, and worse conductor of heat, prevented the access of the water to the plates, and thus caused the overheating. This injury, however, was very learnedly attributed to the generation of a combustible gas in the boiler, and which, on exploding, was supposed to have occasioned the setting fire to the premises. Yet, all this while, no reference was

made to the quantity of deposit being so interposed between the plates and the water.

In another case, from a deficiency of water (through design or neglect), the boiler exhibited the ordinary appearance of having been overheated: some plates were softened, bulged, and ruptured (one of which plates I have now in my possession), and the seams and rivetings, not only along the bottom, but extending to the sides and crown, were deranged, requiring new riveting and caulking. Although accidents of this sort are of daily occurrence in the manufacturing districts, the present was attributed to some imaginary expanding and contracting influence, under an ingeniously supposed alternate heating and cooling process; for notwithstanding the entire bottom and flues were exposed to an uniform stream of heated products of combustion from the furnace, the theory assumed that there was a body of air at one time driving the flame against the boiler bottom and causing it to expand; and again, that the same air caused the same part of the boiler suddenly to contract, until the rivets were dragged in opposite directions (like a man attempting to pull his own arms off), and the boiler so became leaky! The ingenuity of this mode of making the boiler leaky, might however have been spared, had the engineer for a moment considered, that, as this boiler, a new one, had been leaky from the beginning, and even to a considerable extent; and there was no water gauge for exhibiting the height of the water within, the deficiency which led to the overheating and injury, might, without any great stretch of fancy, have been occasioned in this natural way. The air, in this instance, no doubt, was "crude air" (*vulgo*, pure air), and doubtless would not have produced such dire effects had it been "diluted with nitrogen and steam," as recommended by Mr. Armstrong, to whom the above ingenious theory of expanding and contracting is attributed.

When practical men will thus strain after new and speculative sources of injury, while they overlook natural and ordinary causes, it is time that further inquiry be made, and the subject taken out of the hands of quacks and pretenders. A closer view of the principles which practically govern the conduction of heat through metallic bodies, will help to clear away those erroneous notions, and bring the question within narrower and better defined limits.

Hitherto, I have examined the subject with reference to the illustrations which practice presented: I will now draw some from the statements of others.

"If a metallic bar," says Professor Brande, speaking of conduction, "be placed in connexion with a constant source of heat, and we wait till it has taken up a *permanent state of temperature*, we shall find that for distances from the source, taken in arithmetical progression, the excess of temperature above the surrounding medium, will form a geometrical progression."

We have here a defined connexion between those rates of progression, and a "permanent state of temperature" in the conductor bar. Now this "*permanent*" state corresponds with what I have termed the *statical* heat of the bar, and which indicates the degree in which the metal will be affected by heat, injuriously or otherwise. When Mr. Brande uses the term "permanent state," it is not to be taken as referring to any particular temperature, but merely to the condition (as to temperature) in which the conductor may then be placed; and only *cœteris paribus*, as regards the surrounding state of things; inasmuch as each, and every change, will induce a new and varying state, or statical temperature. This, however, will be more apparent as we proceed.

The point now under consideration is this, how far the nature of the recipient will influence this permanent state of statical temperature? The bar and its state, as mentioned by Mr. Brande, we see had reference solely to one kind of recipient for the conducted heat, namely, the air. If, however, it be brought into connexion with a different class of recipients, as oil, mercury, or water, a new and different *pro tempore*, though "permanent state," will be established. In other words, the statical heat will vary as the circumstances which govern it, and which I am endeavouring to show are solely attributable to the nature and properties of such recipient.

What then are the circumstances which modify or govern the statical heat? I here prefer using the term *statical*, rather than *permanent*, as it avoids confusion, and, without any apparent contradiction, involves the idea of a temperature, though still defined, yet varying

according to circumstances. This statical heat, then, must be considered under two relations, namely, as indicating, first, the amount of power exercised by the recipient in carrying away the heat received from the conductor, and secondly, the amount of influence which such power exercises on the conductor itself.

With respect to this direct connexion I find but little notice has been taken. Professor Kelland, of Cambridge (now of Edinburgh), has however, in his "Theory of Heat," distinctly recognised it as demanding attention. Under the head "Convection," he observes, "A mode of loss of heat analogous to conduction, is that to which Dr. Prout has applied the term *convection.* When a hot body is in contact with the air, the part next the body becoming more elastic (rarefied), flies off and is supplied by colder portions; thus the heat of the body is conveyed away more rapidly than it would be if the air were not in motion. It is obvious that this circumstance will materially affect all experiments on the motion of heat, in which it is hardly possible to estimate the effects due to this cause." Now it is this very circumstance, as it affects the condition of the metals employed in evaporative processes, that I am desirous of examining; inasmuch as this "convection," or carrying away, as the term imports, will, in practice, be found to be the primary source of good or evil. Conduction being but the secondary, or induced cause.

Professor Kelland, further on, in examining the mode by which heat is transferred from one part of a body to another, observes, "When speaking of solids, this is called *conduction.* It is clear, from the term itself, that we do not include, under this head, the transfer of heat by *radiation;* nor do we include that transfer which takes place amongst the particles themselves, carrying with them the caloric they have acquired, which we designate *convection.*" It is manifest from this clearly defined distinction between conduction and convection, that as the former refers to solids, so the latter refers to fluids—aeriform or liquid; inasmuch as the "carrying with them" the caloric they have received, involves a mobility among the particles which is inconsistent with the nature of solids, while it is a correct definition of that of fluids.

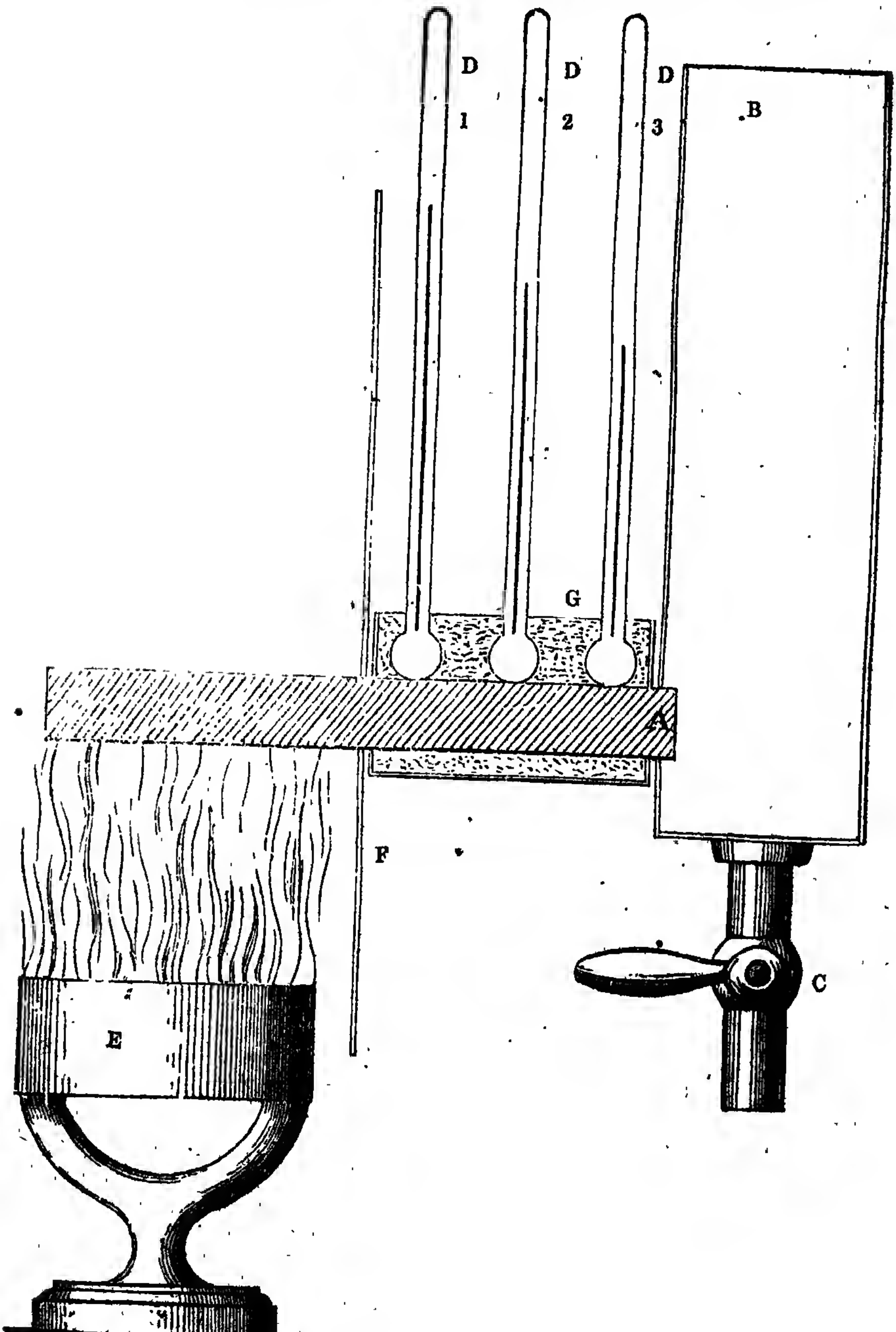
Practically speaking, then, this distinction is peculiarly applicable to our present inquiry, the whole turning on this point, whether conduction or convection be the prime mover in producing those fluctuations of temperature in the conductor which lead to useful or injurious results. Let us now examine, practically, the effect of this convection, or power of carrying away the heat, and the extent to which it influences the heat conducted, both as regards quantity and rapidity.

Let us suppose that a given quantity of heat is passing through a metallic bar, with a rapidity due to its maximum power of conduction; and that it is taken up, or absorbed, by the recipient, with a corresponding rapidity. The temperature of the conductor will then truly indicate that permanent state, referred to by Mr. Brande. If, however, this absorbing power on the part of the recipient be diminished, the rate at which the heat passes from the conductor will also be diminished in the same ratio; and as a necessary corollary, the rate of the current of heat through the conductor will be reduced in a corresponding degree. The practical question then is, to what extent will this "permanent state" or statical temperature of the conductor be affected by such diminished power of convection in the recipient; for this statical heat will ever influence the question whether such conductor be under or overheated. The following experiment will illustrate some of the relations which affect this inquiry.

The annexed engraving, it will be seen, exhibits a state of things, corresponding in principle, to that referred to in your Number 967, in which the thermometer indicated the statical heat of the conductor bar. I have now extended the illustration by lengthening the bar and introducing three thermometers, thus, to indicate the heat at three different sections, and mark more accurately the varying temperatures.

In this engraving, as in the former one, let A represent the conductor bar; B the vessel to contain the recipient, water, or air, or whatever it may be; C the cock for letting off the liquid, when employed as a recipient; D 1, D 2, D 3, the three thermometers, indicating the statical heat at their respective portions of the bar; E the constant source of heat, being that from a powerful gas-burner, furnished with a metallic dome, on the

MR. C. W. WILLIAMS'S HEAT CONDUCTOR BAR.—(ILLUSTRATIVE OF STATICAL AND DYNAMICAL HEAT.)



principle of the "Solar Lamp;" and F, the protecting shield. To these I have now added the chamber G, which was filled with charcoal powder, to act the part of a non-conductor. By this means, radiation from the bar was prevented; the thermometers received heat alone from their points of contact with the bar —the internal streams of conducted heat being confined, as though it were water in a canal or tube.

By the following table, No. 1, we find that in fifty minutes the water in the vessel B was raised to the boiling point, by the issue of what I have called the stream of dynamical heat, from the end of the bar at A. A "permanent state" of temperature was then attained; the thermometers at their respective distances from the source of heat, in arithmetical progression, indicating the temperatures, in geometrical progression, (or sufficiently near for our purpose, for accuracy in this respect was not attempted), of 400°, 309°, 242°,—the extreme difference being 158°. Let us now suppose this to be the state of things in which the *maximum* power of conduction of the metal was brought into action. It is here manifest that the amount of statical heat in the conductor will bear some ratio to the joint power of conduction in the bar and convection in the recipient water.

On the recipient being changed, by letting out the water and letting in the air, a new state of things is induced. The power of convection will be diminished, (air being a worse recipient than water); the quantity of heat received from the conductor in each unit of time will also be diminished; and the rate at which the stream of conducted heat passes through the bar will be influenced in a corresponding degree. The source of heat, however, remaining constant, the inevitable result is that accumulation will take place in the bar, and the thermometers instantly indicate an increase of statical heat. This I believe to be the *rationale* of the process, and this is exactly what we find confirmed in practice. Now, if the velocity of the convection of the new recipient, air, be ascertained, as well as the conductive power of the metal bar, and both taken as constants, we shall be enabled to approximate to the amount of statical heat in the conductor, and the degree in which the metal will be affected.

It is worthy of notice here, that contrary to what might have been expected on the water being withdrawn, the thermometer, nearest to the recipient and farthest from the heat, rose with the greatest rapidity, indicating a species of revulsion, or backing up of the heat; and proving that the increased heat of the bar was referable to the diminished power of the recipient, and not to the supply of heat. This is extremely instructive, proving the diminished power of convection in the recipient air, comparatively with that of water.

TABLE I.

Time in minutes.	Therm. No. 1.	Therm. No. 2.	Therm. No. 3.	Temperature of water.
0	54	54	54	52
5	164	126	98	60
10	244	183	136	90
15	300	222	166	118
20	340	254	189	114
25	366	274	206	168
30	382	288	218	184
35	392	296	227	198
40	398	304	234	210
45	399	306	237	212
50	400	309	242	boiling
55	400	310	242	The water being run off, and the recipient changed to air.
60	413	340	284	
65	438	374	320	
70	454	394	340	
75	464	402	350	
80	472	412	380	
85	476	415	362	
90	476	415	362	

By inspection of this table, No. 1, we find that between the periods, 55 and 60 minutes, (say in five minutes), the thermometer No. 3, (the farthest from the heat), had risen 42°, that is, from 242° to 284°; whereas, No. 1, (that nearest to the heat), rose but 13° in the same five minutes, say from 400° to 413°; thus proving, that what may be called the wave of statical increase had flowed backwards towards the source of heat, and in a manner strictly analogous to what would take place if, instead of a stream of heat, it had been a stream of water in a tube or canal.

The bearing, practically, of this illustration is, that the temperature of a conductor plate or bar will be influenced, not so much by the quantity of heat imparted to the conductor, as by the absorbing or conveeting power of the recipient. This also shows the practical error of attributing injury to what is going on outside the boiler, or in the plates themselves, while we neglect what is taking place within the boiler, where the real source of injury exists.

This table further shows, that, by reason of the restricted power which the air possesses of carrying away the heat from the conductor bar, the temperature of the latter rapidly increases, until a second "permanent" state is established; and when the three thermometers stand, respectively, at 476°, 415°, 362°, the extreme difference here is but 114°, whereas with water as the recipient it was 158°. This relation of 114° to 158°, then, indicates the ratio of the conductive powers of the bar brought into action by the influence of the respective recipients, air and water. Again, we see that this new statical heat of the bar is in the ratio of the convecting power of the recipient; the thermometer nearest to the source of heat rising from 46° to 476,° while that most removed rose from 242° to 362°. Many other instructive relations might here be noticed, if time and space permitted.

The more accurately to observe the varying relations between the statical and dynamical heat, under a different state of things, I reversed the experiment, and began the operation with air as the recipient; then changing it to water, so soon as the first permanent state of temperature was established, and which, by the Table No. II., we see took place in forty-five minutes. The results here are equally interesting and instructive.

TABLE II.

Time in minutes.	Therm. No. 1.	Therm. No. 2.	Therm. No. 3.	
0	54	54	54	
5	170	132	100	
10	270	220	178	The recipient being air, & then changed to water.
15	350	288	237	
20	400	355	280	
25	434	367	311	
30	457	390	333	
35	471	406	349	
40	475	413	360	
45	476	414	362	Temperature of water.
50	476	414	362	54
55	432	315	230	127
60	388	298	*228	153
65	380	296	232	173
70	374	*296	236	186
75	*372	297	239	200
80	373	299	241	208
85	380	303	243	211
90	388	306	244	212
95	392	309	244	boiling

The three thermometers, we see, continued rising until they arrived respectively at 476°, 414°, 360°, when they remained stationary, such being the indicated amount of statical heat. (It should here be observed, that these numbers cannot be taken as giving the *absolute* temperature of the bar, although they approach sufficiently near to give the *relative* temperatures, under the influence of the recipients, air and water. It will hereafter be shown how near they approach to such absolute temperature.) The recipient being now changed from air to water—the latter being poured into the vessel B—we see the superior convecting power of the latter at once brought into action, by the immediate lowering of the temperature of the bar. On the water being again raised to the boiling point, a permanent state is again established, as in the preceding example, whatever variance has taken place being accidental. It is here important to observe how the analogy between the current of conducted heat and a current of water is maintained; for we see that, although thermometer No. 3 arrives at its minimum, 228°, in 60 minutes, as marked with an *, No. 2 does not reach it until after 70 minutes, and No. 1 until 75 minutes. These experiments were made with great care, although the adjustment of the apparatus required much exactness, to produce uniform results. Throughout the whole we see sufficient to justify the observation, that much remains yet to be done, before this complicated subject be exhausted. The practical inference I draw from the above experiments is, that they afford sufficient proof of the position before stated, namely, that it is not to the furnace or draught, or activity of the fire, we are to look for that accumulation of heat in the plates of ordinary boilers which produces overheating and rupture, but to the recipient, and its powers of carrying away and absorbing the heat which the conductor plate or bar is capable of imparting.

Purposing to continue this subject on a future occasion,

I am yours, &c.,

C. W. Williams.

Liverpool, Feb. 21, 1842.

FURNACES AND BOILERS—MR. ARMSTRONG IN REPLY TO MR. C. W. WILLIAMS.

Sir,—I had written a reply to and refutation of Mr. C. W. Williams's funny review of *my* "diffuso-separative" theory, as he calls it, in No. 963 of your Magazine, before

I saw the second part of that review inserted in the succeeding Number for January 29th.

* * * *

Not, however, being blessed with that morbid thin-skinnedness, so characteristic of Mr. W.'s countrymen, as to feel very extremely alarmed at the first flash of his double-tubed pop-gun communication,* * * I was induced to lay by my reply * * * to be used at a more convenient season, "for reasons," as he has it, in his own "*recantation*" at page 111 of your last Magazine but one, "which will appear hereafter."

Although you declined to publish my last letter in reply to Mr. Dirck's attack on me last year, respecting this same "smoke-nuisance" controversy, I still confidently expect that your sense of justice and propriety will induce you to insert *unmutilated* the enclosed copy of my report on the failure of Mr. Williams's patent furnace at the works of Messrs. Hamnett and Co., of Manchester, and which report was first printed by me in July last, and since published in the *Mining Journal* and elsewhere.*

After perusing this report, I trust your readers will be able to appreciate in a proper manner Mr. Williams's repeated assertion that I made that report before I had seen "a single furnace erected by him," or by his "directions." Why, this very furnace was erected by his advertised agents Dircks and Co., Mr. Williams himself being present when it was tried, and a witness to its failure. An alteration was afterwards made by Mr. Williams's direction, and then it failed again by the giving way of the boiler: as it is demonstrable it always must do, whenever the engine is fully loaded, or a considerable supply of steam is wanted from the boiler, so as to require tolerably hard firing.

The above facts have been verified to the satisfaction of every one who has chosen to inquire of the proprietors of the boiler in question; and the same consequences have ensued, many of them fatal to human life, and must inevitably ensue again, wherever Mr. Williams's principle of letting in cold air at or beyond the bridge of the furnace has been carried out under the same circumstances.

Another of several of the patent furnaces examined by me was on the premises of those same agents, Dircks and Co., engineers, &c., Vulcan-street, Liverpool, which the public were repeatedly invited to inspect by public advertisement, and which I described and condemned in the *Liverpool Mercury* twelve months ago, as well as in your Magazine for March 6th of last year.

It is certainly true that Mr. W. threw the legal responsibility for the damage done to the boiler, in the first case above mentioned, on his agents. But, if Mr. Williams really thinks it necessary to endeavour to get rid of these facts on the ground of his not being responsible for his agents, then, indeed, his case is more hopeless than even I had sup-

The desperate case in which Mr. Williams finds himself is still, however, more clearly evinced by this last strange exhibition of himself in your pages. In page 88 of the *Mechanics' Magazine*, he gravely states that *I wrote* to his agent a letter of "*recantation*," which he professes to quote from, beginning as follows:—"I find that the opinions expressed in my report before named were formed on erroneous data," &c. &c. Now, for a reckless audacious assertion, such as I have before had occasion to give to its author its only proper name, this deliberately written one beats all that I believe was ever before recorded in the annals of mendacity, and really deserves a patent for its originality;* for I not only never wrote a single line or a word of what he charges me with, nor authorised any one to do so for me, nor have I ever expressed a single syllable, either verbally or otherwise, to the effect stated by him; but I have never even had the least communication with either himself, his agents, or his solicitors, in any way, or on any subject whatever, since the letter, from which the extract referred to in the above-quoted passage appears to have been taken, was written; *that letter being written by himself*, or his agents, and sent to me by his solicitors, annexed to one from them-

* The *truth* of the report referred to is denied by Mr. Williams, and Mr. Armstrong afterwards admits that it is the subject of an action pending against him for libel. We do not, under these circumstances, consider that we should be acting either with "justice," or "propriety," were we to comply with his request. When proved to be no libel, we shall be very ready to give it a place in our pages; but if it be one, it has had more than sufficient publicity already. We may here add, in explanation of the asterisks in the first paragraph of this letter, that they denote parts which we have left out, because we cannot allow our pages to be made, on any pretext, the medium of wanton insult to any one, far less to a scientific inquirer of so original, so philosophical, so practically useful, and withal so sincere and candid a stamp as Mr. Williams.—Ed. M. M.

* Mr. Armstrong is aware that Mr. Williams recalled the statement in question of his own accord, the moment he saw it in print—for this is what he previously alludes to, as Mr. Williams's "recantation at page 111;" and to speak of an acknowledged mistake in such terms as these is not right. We must, in justice to Mr. Williams, add, that he wrote to us to make the necessary correction in the statement, even before it appeared in print; but, in consequence of the Number in which it was published happening to be printed off a day earlier in the week than usual, his letter came to hand a day too late for the purpose.—Ed. M. M.

selves, dated the 10th of December last, informing me that they were instructed to commence legal proceedings against me for the recovery of damages for injury sustained by the circulation of my report before named, unless that annexed letter of recantation was signed before the expiration of the next day. Accordingly, in a very few days afterwards, I was served with what is called a "copy of a writ," desiring me to appear at a certain place in Westminster, in an inconveniently short space of time. This proceeding, I confess, really did alarm me a little at the moment, rather more than any thing Mr. Williams is able to write in your Magazine. I showed the document to several of my friends, who were all as much astonished at it as myself, knowing well that I had said nothing but what every one who knew me believed to be true; but they all advised me to put it into the hands of a respectable solicitor, which I accordingly did, together with my "Copy of Report," and his solicitor's letter above mentioned, where I suppose they will all be dealt with according to law. What Mr. Williams's next move will be, I know not; but I think he is in a fair way to prove himself almost as clever at his own proper business, "law," as he is at smoke-burning.

I am, Sir, yours, &c.,

R. ARMSTRONG.

Victoria Arches, Manchester.
February 19, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JOHN THOMAS CARR, OF THE TOWN AND COUNTY OF NEWCASTLE-UPON-TYNE, *for improvements in steam engines.* (A communication.) Enrolment office, Feb. 21, 1842.

The steam-engine constructed according to these improvements, has its piston-rod working through a stuffing-box, having the character of a universal joint. This stuffing-box is a spherical box, working in a ball upon the top of a box which slides to and fro by dovetailed joints in the steam cylinder cover. The piston-rod is jointed to the piston and attached directly to the crank of the driving shaft; the universal jointed stuffing-box and the sliding-box, conforming to its movement and vibrating backward and forward to the extent of its deviation from the perpendicular. The air-pump is placed immediately beneath the cylinder, and worked by its bucket-rod, being attached to the under-side of the steam-piston, passing through a stuffing-box in the base of the steam-cylinder.

The valves are worked by the sliding-box before mentioned in the following manner:—a stud or pin projects from the front side of the box and works in the lower limb of a T-shaped lever, centred in the middle of the horizontal portion. At each extremity of the upper arms is fixed a pin, from one of which a connecting-rod passes down to the valve-rod. As the box slides backward and forward upon the cylinder, a rocking or oscillating motion is given to the lever, and the raising or depressing of the valve-rod effected. In order to reverse the motion of the engine, the valve-rod is merely shifted from the one arm to the other, which brings about the desired end.

Another arrangement for reversing the motion of steam-engines, without altering the valves or gearing, consists in placing an intermediate slide or port-piece between the D valve and the cylinder-ports, by shifting of which, the induction and eduction passages become reversed.

For working the cold and hot water pumps, the following arrangement is adopted. On the opposite end of the main shaft to that at which the crank is situated, the first motion wheel is keyed, and on the outer face of this wheel, a pin is placed eccentrically to its axis; from this a connecting-rod passes down to a triangular-shaped block of metal, working between two upright guides; to this block, the piston of the cold water pump, and the plunger of the hot water pump, are attached,—the object of the weight being to counterbalance the piston, air-pump, bucket, &c.

In lieu of the ordinary governor, the patentee employs the following apparatus:—A pulley is driven by means of a belt on the driving-shaft, and upon the periphery of this pulley rests a smaller pulley, attached to a bell-crank lever in connexion with the throttle-valve of the engine. At the regulated speed of working, the two pulleys merely revolve in contact; but should that speed be exceeded, the small pulley is drawn forward by the increased velocity of the larger one, and the throttle-valve being acted upon, partially shuts off the steam.

The claim is, 1. To the method and arrangement for working the valves of steam-engines, by taking the motion directly from the moveable stuffing-box of the piston-rod, and conveying it to the valve-rod, and for the arrangement for reversing the motion of the engine; 2. To the method of reversing the motion of steam-engines, without altering the valves or gear; 3. To the method and arrangement for working the hot and cold water pumps, and for counterbalancing the weight of piston, air-pump bucket, &c.;

4. To the method and arrangement for regulating the motion of steam or other fluid engines by means of a frictional governor.

CHARLES DE BERGUE, OF BROAD-STREET, LONDON, MERCHANT, *for improvements in axletrees and axletree boxes.* (A communication.) Enrolment Office, February 21, 1842.

The axletree has two shoulders of increased diameters near its inner extremity, between which a divided nut of iron, steel, brass, or other suitable metal, is placed. On the outside of this nut a male threaded screw is cut, and a corresponding female-threaded screw is cut in the end of the axletree box to receive it.

On putting this divided nut between the two projections on the axletree, and then screwing it into the axletree box, they become firmly and securely united together, and the wheel cannot come off until the nut is unscrewed. In order to prevent the screw working loose, it is screwed up the reverse way to the wheel's progressive motion. A small cap or chamber is screwed into the front of the axletree box, to contain a supply of oil for lubricating the axle; there is also a recess cut about the middle of the axle, and another in the box or bush around the inner shoulder, while an accurately-turned groove in the hinder shoulder is filled with sponge, or other suitable packing, to prevent the escape of the oil.

The claim is to the divided nut and the screwed part of the axletree box, as applied to axletrees and axletree boxes.

GEORGE HICKES, OF MANCHESTER, AGENT, *for an improved machine for cleaning or freeing wool, and other fibrous materials, of burs and other extraneous substances.* Enrolment Office, February 21, 1842.

This machine consists of four equidistant horizontal shafts, running parallel to each other on a frame of wood or iron. In front of each shaft is a set of drawing-rollers, which deliver the wool to the beaters. Under each set of beaters is an open grate, so curved as to form part of the circle described by the extremities of the beaters as they revolve. A narrow plate is placed in a vertical position, immediately below the delivering-roller of each set, and on it the wool is beaten, as it is delivered; the burs falling through the grate as they are struck out from the wool. Each set of drawing-rollers is provided with a feeding-cloth, and when the machine is put into operation, the upper sides of the feeding-cloths move in the direction of the drawing-rollers; the beaters on the first two shafts revolve at one speed, while those on the last two shafts revolve rather faster. The drawing-rollers likewise correspond in their respective speeds. Supposing wool to be opened and spread on the feeding-cloth in front, it is received by the first set of drawing-rollers, when it is slightly drawn, and delivered to the action of the first beater, which partly frees it from burs and other extraneous substances, delivering the wool over the grate, on to the second feeding-cloth; from this cloth it proceeds forwards to the succeeding rollers, when it is drawn, beaten, and finally delivered in a finished state into a hopper, or other suitable receptacle.

The space between each blade of the beater is filled up by sheet-iron, wire gauze, or other suitable material, to prevent the wool from adhering to the beaters, which must be sufficiently far apart to prevent the staple of the wool reaching from one to the other during the operation.

The under roller of each set is provided with a doctor, having an alternating end motion given it; and the doctor is held against the second of the set by a weight hung on a tail-piece, so that it has a constant tendency to press the doctor against the under part of the roller, and free it from any dirt or extraneous matter which might cause the wool to lap, and impede the action of the machine. The doctor, with the apparatus which supports it, is traversed backwards and forwards by a crank, or eccentric, at the end of the driving rollers.

In another arrangement for delivering the wool from one beater to another, the feeding-cloth is put in an inclined position, the end near the drawing-rollers being the highest. Immediately over the cloth is placed a moving grate, the end of which is triangular. The wool is received against the upright side of this grate when delivered from the beater behind; the burs pass through the upright side, and fall on a tray inside the grate, while the wool is drawn down by the motion of the moving grate, and is carried forward between it and the feeding-cloth beneath, to the succeeding drawing-rollers.

The claim is, 1. To the general construction and arrangement of an improved machine, as regards the beaters being used in combination with a curved rack and drawing-roller; 2. To the particular construction of the beaters, and the application of a doctor, used in combination with a curved rack and drawing-rollers; 3. To the plate on which the wool is dressed, or subjected to the action of the beaters; 4. To the whole moving grate, with its rollers and tray on which the wool is thrown on leaving the beaters, as described and applied as above.

NOTES AND NOTICES.

Inefficacy of Electro-Magnetism as a Moving Power.—Mr. J. P. Joule, in a paper on this subject, lately read at the Manchester Royal Victoria Gallery, stated the following to be the greatest result he had been able to obtain, with a powerful apparatus. Each pound of zinc produced a mechanical force which raised 334,400 lbs. to the height of one foot, when the revolving magnets moved eight feet per second. The duty of the best Cornish steam-engine is 1,500,000 lbs., or nearly five times the extreme duty he was able to obtain by the consumption of one pound of zinc. This was so very unfavourable a result, that he almost despaired of electro-magnetism being applicable to mechanical purposes in the place of steam. He did not see how any arrangement of the apparatus could make the duty of a pound of zinc much superior to the duty of a pound of coal; and, even if it could be attained the expense of zinc was so great, compared with the price of coal, as to prevent such apparatus being ever used for any but peculiar purposes. Professor Phillips also stated, in the course of a discussion which followed the reading of Mr. Joule's paper, that he had tried every plan, American and German, locomotive and stationary, and never yet found one apparatus that could not be stopped with the finger. The most perfect plan he had seen was one where there were two horse-shoe magnets; the two poles were always in contact, and the centre of motion was the line adjoining the two poles. Though it had a lifting power of 200, he found it difficult to get a sufficient length of stroke; he was obliged to get it by a lever of the third kind, which reduced the power so much, that he could not get the lever to work. He tried it with a weight of 3 lbs., and it worked very well when the wheels were lifted up, but it would not move itself, it would not start. The distinction was overlooked between pulling and supporting. A magnet would support an enormous weight in contact, but, at a distance of a quarter of an inch, it would not, perhaps, pull 2 lbs. A magnet that would support 2 cwt. would, perhaps, pull only a quarter of a pound a quarter of an inch.

Captain Ericsson's Propeller. — The *Kingston (Canada) Chronicle* mentions a very successful application of this propeller to a steam-vessel called the "Vandalia," which plies between Kingston and Oswego. The vessel is described as of 140 tons burthen, 90 feet long, and 20 feet 2 inches wide; drawing, when light, 2 feet 6 inches, and when loaded, about 6 feet. The boiler is on the locomotive plan, with about 100 pipes running through it. The engine consists of two cylinders of about 12 inches diameter, and the motion is communicated directly to the crank or the shaft of the propellers, which are 4 feet 6 inches in diameter, and placed one on each side of the rudder, working towards each other, in the manner of sculling. The engine makes from 60 to 75 strokes a minute, and is worked generally with steam at about 55 lbs. pressure. The speed realized, under favourable circumstances, is from 9 to 10 miles per hour. "She has been to Hamilton," the account adds, "and up the Welland Canal, with cargoes; no perceptible motion occurs on the banks of the canal, more than occurs by vessels when towed up in the usual manner. She has encountered two or three heavy gales, and behaved exceedingly well; she steers admirably."

The Society of Arts and Patent Inventions.—In pursuance of a Report from a Select Committee of this Society, appointed to consider the best means of extending its usefulness, (*i. e.* of redeeming it from the state of comparative *uselessness* into which it has of late fallen,) notices of *patent* inventions, heretofore excluded from the class of subjects which the Society honoured with its attention, are to be received and read at the weekly meetings. "The reading of each paper," it is stated, "will be followed by *a discussion*, for the purpose of eliciting from the experience of those who are practically engaged in the arts and manufactures such information as may give the subject a sufficient degree of completeness to make it *serve as a guide for the public as to the real value of the invention.*" We anticipate but little good from this scheme; none whatever for the public, and not much for the Society. The "notices" will be puffs, and the "discussions" upon them either fulsome testimonials bespoke for the occasion, or unmannerly brawls between rival pretenders and their partisans

Gifts to Mechanics' Institutions.—The public-spirited and philanthropic Mr. Joseph Strutt has presented to the Derby Mechanics' Institution, of which he is President, 22 excellent paintings, by eminent ancient and modern masters, including a fine piece by Poussin, and some of the best productions of West and Fuseli, accompanied by a letter, in which he expresses a hope, (in which we cordially join,) that "they may prove to others a stimulus to increase the collection, and thereby encourage those among the students who are improving themselves in the arts of drawing and painting." The *Aberdeen Herald* records a similar instance of munificent liberality on the part of a Scotch nobleman. "Lord Panmure has formally made over to the new Mechanics' Institution, Brechin, the handsome apartments which he erected for its use, together with the fine collection of paintings which decorate the hall. His Lordship at the same time handed to the President and Vice-President a check for 1,000*l.*, to be vested in trustees for behoof of the institution. Thus, by the enlightened liberality of this nobleman, the youth of Brechin have been provided with elegant schools, and the mechanics with a splendid hall, and the means of obtaining instruction in useful knowledge and rational amusement in all time coming."

Coal in India.—Colonel Sykes, at a late meeting of the Asiatic Society, mentioned, as an instance of the long prevailing ignorance, in this country, of the resources of India, that though a few years ago coal was supposed to be utterly unknown throughout that vast region, there are no less than fifty-seven localities in which it has been now ascertained to exist.

The Artesian Well at Grenelle.—A new tube is now making for the well of Grenelle in iron, of such a thickness that it will bear the pressure of 50 to 60 atmospheres. Experiments have been tried on two tubes placed one within the other, as the tubes were in the bore of the well, to ascertain what degrees of pressure would be necessary to force them in; but though the hydraulic ram was employed, it required a pressure of from 12 to 15 atmospheres to produce any effect on the tubes. The water still flows as copiously as ever, moderately warm, and alternately limpid and black as the sewers of Paris. —*Galignani's Messenger.*

Swiss Watch Manufacture.—There is no branch of Swiss industry so prosperous as its watch manufacture. Four years ago 70,000 watches were annually made. At least 100,000 are now produced. A great deal of the work is done in the mountains, and nearly all the rough work is done there by women, the finer work by men. The wages are very low, considering the nature of the work; but the fact is, that there is no scarcity of that skill and sobriety, and steadiness of hand and eye, essential to this class of work. It is in-door work, too, and suits them during the long continuance of weather too inclement in the mountains to permit of open air occupation. It is surprising how few are the tools, and how delicate the use of them by the artisan peasantry, who carry on this manufacture in Switzerland. Carouges and Geneva are the great marts of the trade, and thence work is given out to the surrounding villagers, and they must work hard to earn two francs a day; the majority do not average more than 30 sols. (15*d.*)—The superiority of the watch manufacture is a signal evidence of the skill and merit of the people. The perfection

to which the art is brought is universally acknowledged, and both for elegance, accuracy, and finish, the Swiss watches year by year, take a higher rank in European estimation. It is an achievement of mind and morals. Neither an ignorant nor an immoral people could excel in this difficult and delicate handicraft. — *Correspondent of the Athenæum.*

Mechanical Nomenclature.—The Industrial Society of Mulhausen have addressed to the French Minister of Commerce, a memoir on the importance of adopting an unit of measure for the force of machines, considered not only in the power exerted, but in the time required. The Society observe, that the usual estimation of horse-power is not uniform, and propose that the unit for France should be the force required to raise one kilogramme to the height of a metre in a second. To this unit they propose that the name of *dyne*, from the Greek root, signifying, "moving force," should be applied, and then that it should be compounded with Greek and Latin words, in the same way as the metre, the gramme, &c. Thus the *kilodyne* would signify a thousand times this unit, and the *millidyne* would signify the thousandth part of the same unit.

Cure for Damp Rooms.—A correspondent of the Bengal *Hurkaru* asks, "How the floors of lower-roomed houses may be cured of humidity?" By a barrel or two of tar laid on and covered with fine sand, and then beaten as floors are wont to be. The remedy is cheap and infallible. A suite of rooms, to our knowledge, which were so damp that the mats rotted in a month, were thus laid with tar, and there has not been the slightest symptom of dampness for the last six years. A set of mats now lasts two and three years, and the white ants have disappeared.

Naval Architecture.—We have seen a model of a vessel, of a curious and novel construction, to which we would direct the attention of nautical readers. The object is—swift sailing with facility of manœuvring, in order to accomplish which, the keel is made very deep at a point in the centre, and slopes upwards towards the bow and stern in the form of an obtuse angle. The inventor supposes that a vessel with a keel so constructed, would sail very close to the wind, while it would obey the helm much more quickly than an ordinary vessel, as it would turn in the water as it were upon a pivot. There is also a peculiarity in the rigging, the masts, three in number, radiating from the centre, the mainmast being upright—the foremost sloping forward, and the mizen having a similar rake backward. This arrangement is to suit the form of the sails, which are, with the exception of some of those on the mainmast, triangular, with a view to have the principal pressure on the canvass as low as possible for the sake of safety, and also to facilitate tacking. It is impossible to explain the plan thoroughly without diagrams, and we question whether even nautical men could venture a decided opinion on its merits without an experiment on a large scale. Meanwhile we think the invention worthy the attention of the Northern Yacht Club, or some gentlemen interested in naval architecture. The constructor of the model is Mr. Dempster, Kinghorne.—*Scotch Paper.*

Copper Sheathing.—A paper, by Mr. Wilkinson, was read at the Institution of Civil Engineers, Feb. 22. A member remarked, that his attention had been drawn to protection afforded to timber by coal tar when properly prepared and applied; the experiment had been tried carefully on board an India ship—some portions being coated with vegetable tar, and others with coal tar; the latter had preserved the timber from the worm during a long voyage, while in many places the former had failed. He attributed the superior qualities of the coal tar to its containing a quantity of sulpho-cyanic or sulpho-prussic acid, which inevitably destroyed animal or vegetable life. A member had observed, at New York, that piles prepared by kyanizing had been destroyed in the same situations, where timber, which had been saturated with coal oil, had resisted the attacks of the Teredo. The statement of the last speaker was confirmed by a member, who stated, that in the Mediterranean, where the ravages of the worm were most extensive, the vessels being rarely coppered, were entirely protected by prepared coal tar. The coal tar must, however, be deprived of the ammonia, as that substance produced immediate decay in timber: ammonia might be advantageously used for manure in peaty soil, as it destroyed the vegetable fibre with great rapidity, and produced rich soil.

Earthquake in Cornwall.—A severe shock of an earthquake was experienced on Thursday morning, the 17th ult. at about half-past eight, throughout the great mining districts of Cornwall, extending from the sea shore to the south of Helstone to almost the opposite coast, north of Redruth. The shock was distinctly felt at Flushing, Falmouth, Penryn, Gwennap and Redruth, but did not reach so far eastward as Truro. The miners at work in the lower levels at Trewavas, which are under the sea, in the parish of Breage, hurried to the surface, supposing that an irruption of the sea had taken place into the mine, as they heard a confused noise which accompanied the shock. This phenomenon is exceedingly rare in Cornwall.

Electro-Lace.—At the London Electrical Society, (Feb. 15,) the Secretary read a description of "electro-lace," a novel, but pretty application of the electrotype. The basis is net, prepared according to the usual plans. A few hours' action so covers it with copper, that it seems converted into that metal. Specimens were exhibited, which were much admired. It opens a new and wide field for the extension of this art to the production of those delicate and chaste ornaments, and fancy articles, now constructed of perforated cards, &c. The lace is readily plated; nor is the application confined to this article alone, but may be extended to all the various gauzes and delicate fabrics with which the market abounds.

The *Little Western* is certainly a favourable example of the skill of Bristol mechanicians, but that there is any thing either in the structure of the hull or machinery pre-eminently excellent, we utterly deny. In the production of the vessel there appears to have been too great a straining after novelty, and there are evidences of a disposition to select arrangements, not so much by the consideration of what is excellent, as of what is unusual. The following are some of the proportions of the vessel and engines: she is 721 tons; measures between perpendiculars, 200 ft.; over all, 218 ft.; keel, 195 ft.; breadth of beam, 27 ft., and, including paddle-boxes, 47 ft.; length of saloon, 44 ft., by 24 ft. wide; ladies' cabin, 20 ft. long.—*The Civil Engineer and Architect's Journal.*

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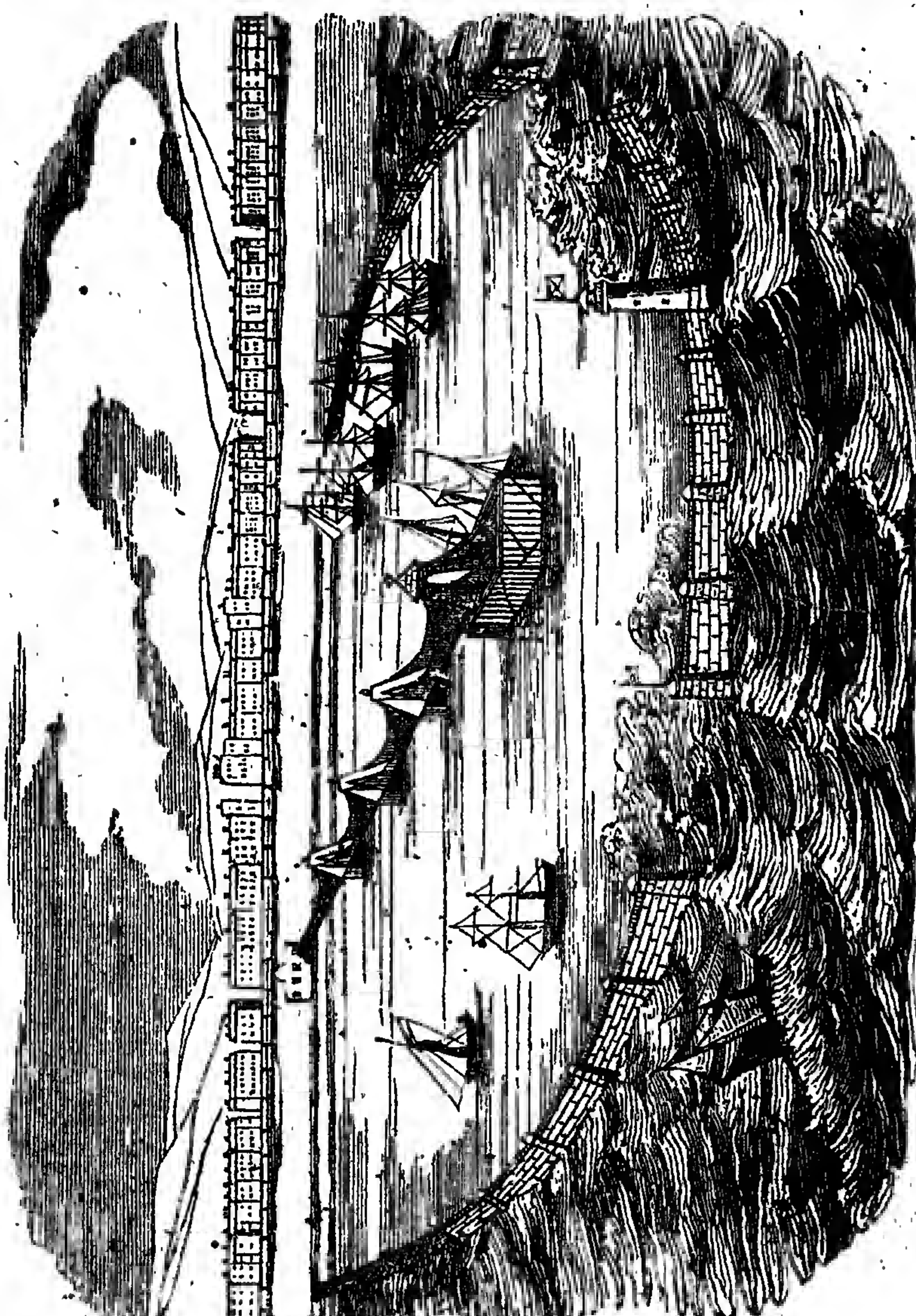


WIGNEY'S PROPOSED BRIGHTON HARBOUR.

ON THE CONSTRUCTION OF CAST-IRON AND CONCRETE BREAKWATERS FOR THE FORMATION OF HARBOURS, PIERS, JETTIES, WHARFS, DOCKS, EMBANKMENTS, GROYNES, ETC. BY MR. GEORGE ADOLPHUS WIGNEY, BREWER, BRIGHTON.

Sir, — Having conferred on me the favour to insert the principal portion (No. 963, page 70, of the present volume of your valuable work) of my Address to "My fellow Townsmen," relative to the formation of a harbour of refuge, and for pleasurable purposes, for the town of Brighton, constructed of solid breakwaters, composed of cast-iron plates filled with concrete, I now send you a perspective sketch of the same, and of the lighthouse, the two adjoining towers, and intermediate caissons, which I suggested should be first construoted and put down as an experimental test of the principle, and with a view to the obtainment of requisite experience, preparatory to the execution of the whole.

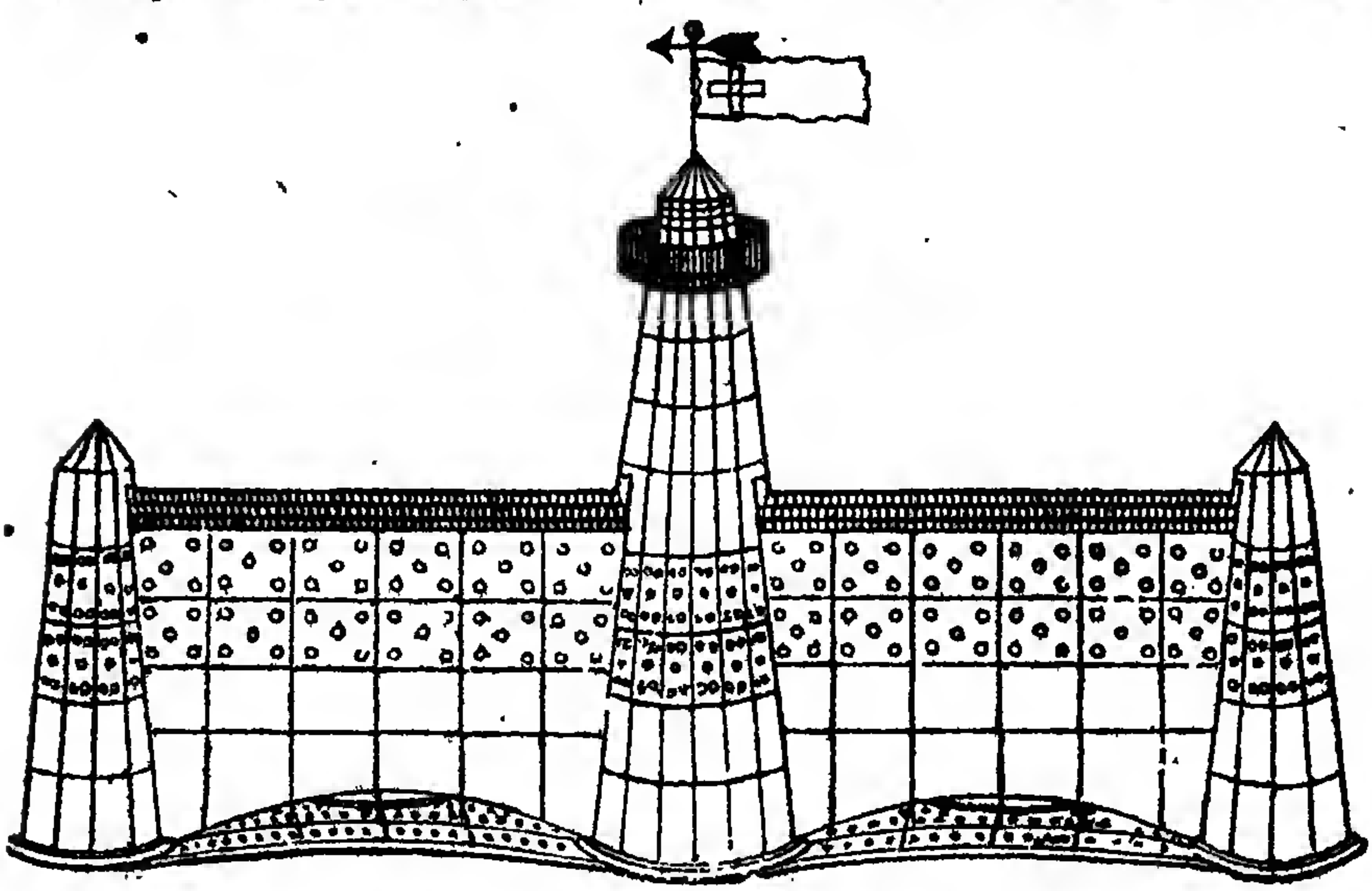
Having furnished explanatory details relative to the work as a structure, in the Address referred to, and which, with the accompanying sketches will furnish sufficient information to your readers of the materials, and the mode and principle of its construction, a few additional particulars omitted in that Address, and furnished in the same consecutive order, will alone be requisite to convey to their minds, all that appears to me to be needed on the subject.

I. *The Breakwater considered as a Structure.*—A perspective design of the harbour, and a model of the lighthouse, the two adjacent towers and the intermediate caissons, have for the last six weeks been exhibited at the Town Hall of this place, and the only objection, which has yet met my ears to it as a structure is, the anticipated destruction of the cast-iron plates by oxidation. To obviate such apprehension, I beg to state, that the coating of them with gas tar, I propose should be accomplished in a way suggested to me by Mr. Rutter, Manager of the Original Brighton Gas Company's Works, by causing each plate, when cast, and cooled down to a suitable, yet elevated temperature, to be plunged into a tank of gas tar, when, being in an expanded state, the tar will, in a slight measure penetrate its pores, and by subsequent contraction retain it within them. Concurring with Mr. Rutter, in opinion, that by such a procedure, they will also acquire a highly glazed and concentrated coat, well calculated to resist the action of salt water, I avail myself of this opportunity to acknowledge and state his suggestion, and at the same time to express a request to any of your numerous correspondents, not only to oblige me through the medium of your pages with any useful suggestions they may be able to furnish, but also to point out any defects which they may perceive in the principle or materials of the proposed structure. I trust that my deviation from my profession as a brewer to take up temporarily the profession of an amateur engineer, will not induce any gentleman of that profession to withhold any useful information, the more particularly as to their contributions to your pages, I stand principally indebted for that little portion of knowledge which I possess in this department of the sciences. Should the gas-tar thus applied be deemed, or found insufficient to furnish the required protection, it becomes a question of efficacy and cost, whether zinc might not be advantageously employed to protect those plates which may be constantly and occasionally immersed in water. But, independent of either resource, I presume that their durability would be very considerable, and much more so than wood, which is so subject to the ravages of sea lice, of which the piles of our chain pier already furnish a demonstrative proof.

The whole of the flanges I propose to turn inwards, with a view to protect the bolts from oxidation. The concrete may be composed of lime, sand, and gravel, and concentrated gas-tar and gravel, the latter material to be placed in contact with the plates within in the form of blocks, and the centre to be filled with the former. I feel pleasure in being able also to record for publicity, that which appears to me to be a most valuable suggestion for the improvement of the principle of construction of my breakwaters, as furnished me by Mr. Matthews, who has for about the last 20 years acted as the managing master of the chain pier, and whose judgment and experience in such subjects, I think no one will doubt. To diminish the force of the waves, Mr. M. suggests, that both towers and caissons should be perforated with a series of cast-iron tubes passing through the concrete and the sides, open at both ends, flanged at the extremities, and thereby connecting more firmly together the opposite sides; placed of course at a suitable angle from a horizontal position, dipping toward the exterior, (or as it may be termed, the storm side of each breakwater,) in order that a portion of the water composing each wave, may pass through each tube, and thereby break and divide its impulsive force. Being posited at such an angle, such portion of the water of each wave, as

is not forced through to the inner basin, for want of a sufficient impelling force, would return again to meet, and in a measure break the force of each succeeding wave.

II. *As a fortified Harbour and an armed line of defence for the Town in time of War.*—The paramount duty of a paternal government, appears to me to be, to provide for war in the time of peace, not only with a view to prepare for inevitable defence, but also to repress any agressive disposition which may be entertained by latent enemies, by our exhibition of real defensive and offensive power, ever ready to be brought into prompt and energetic action. The measures which our executive have adopted for offensive operations, both as relates to the navy and army, recent events have proved to be adequate to present wants, and offer the satisfactory promise of capabilities equal to any future need. But such cannot be said of our defensive resources; for where between Dover and Portsmouth (without travelling further) is there a single port fit for the entrance or exit of a defensive fleet? Or where is there a battery fit to repel a single ship of war? Having heard of and seen, and somewhat felt, the general consternation and dread that prevailed along the southern coast, in early life, when those formidable and extensive preparations were made on the part of France for the invasion of England—when mercenary troops were hired and encamped along our shores—when Sussex guides were appointed to lead the aged and the young, together with the weaker sex, into the interior,—when the land defences, the Martello Towers, few and far between, were erected—and which invasion, with all its attendant horrors, only appeared to be prevented, by the diversion of those immense forces which were collected at Boulogne for the purpose, caused by the threatening and aggressive attitude of the great Northern Powers—I cannot but put the question to others and myself, why may not danger of an equal, or far more serious character, arise? What may be the promptings to aggression, and what the increase of power to inflict misery and devastation on our shores, it is impossible to foretell; considering especially the facilities which steam vessels of war, and improved projectile implements of warfare, in existence and in embryo, afford to powerful and ambitious neighbours to carry schemes of devastation, (if not of conquest,) into sudden execution, while circumstances may have placed our floating bulwarks at too great a distance, or beyond the reach of rescue, to arrive in time to avert the impending evils that may be poured upon us at every turn and opportunity. Where are the improvements of defence which have been, or rather might have been, effected along our unsheltered coast? At the time I allude to, Brighton, though in its infancy, was crowned with three batteries,—a western, eastern, and a central; but since then, it has risen to a high state of opulence, and grandeur, and those defences are diminished from three to one, and that one, as compared with the marine frontage, and extent of the town, may fairly be termed but a state toy, merely kept up for the purpose of firing royal



salutes, on birthdays and arrivals. Can the inhabitants of Brighton, who possess so large an amount of property in so indefensible a condition, many of whom have risen by its rising, have prospered on its greatness, and the whole of whom have so great a stake in the continuance of its prosperity—or can the government, who derive so large a revenue, both by direct and indirect taxation, from its various resources—remain much longer indifferent to so hazardous a state of things? By the plan to which I solicit attention, a fixed and permanent defensive protection from towers and ramparts would be establishd of any extent that may be deemed desirable, and the southern line of which, extending, as it may, from three to four thousand feet distance from the shore, would be found sufficient to prevent either shot or shell reaching the town from any invading fleet, while within the line of fortifications a naval force of any requisite magnitude might ride at anchor, able at all times of tide to leave the haven and chase the foe? And these accompanied by all the other advantages which have been, and yet remain to be enumerated, are obtainable at a cost but little, if any, exceeding that of a single steam frigate.

III. *As a Mercantile Harbour.*—In the Address referred to, I stated that we happily do not at present need one, already having one within the short distance of from three to four miles, and by a connecting railway within ten minutes ride from its mouth; and having set out upon the principle of not advocating, but, on the contrary, repudiating, the principle of endeavouring to interfere with the vested rights of others, I am not now going to change my course, although upon subsequent reflection I have come to the conclusion, that we partially need a mercantile harbour, though perhaps not one that is free and unrestricted for the admission of vessels of every class of merchandise. For, in the first instance, I think we need a mercantile harbour, restricted to the admission of vessels of such a burthen as cannot, or will not, enter the port of Shoreham, and which are freighted with what may be termed clean cargoes, not only for the sake of bringing to our town, by direct communication, many of those articles of merchandise that are continually passing by, and ultimately received by us, by a very long and circuitous route, at prices much enhanced by the superfluous extra cost of freight, of distant port expenses, and inland carriage; but also with a view to derive a portion, from such a source, of that income which is requisite to cover the annual disbursements, and furnish a remunerative interest to the shareholders. Hopeless as such a source of income may at first sight appear to many who are not well acquainted with the sinews and energetic grasp of commerce, it may be sufficient to refer them to the blank value of the one hundred pound shares in Shoreham harbour, about twenty years since, when I saw five of those shares treated as mere waste paper, which are now worth 250*l.* each, and on which the present annual dividends are 15 per cent. I know not why the future prospects of a "Brighton Harbour Company" might not brighten up to such a splendid polish. And what could the shareholders of the matron harbour lose by yielding to its more comely daughter, in addition to the gay trappings of pleasure, which it would be her first and paramount object to wear, a few of those substantial sources of revenue which she has not the capacity to receive and enjoy? Are there none, nay, are there not many of the Shoreham Harbour shareholders who are large owners of property, both in Brighton and its immediate vicinity, and who are deeply interested in the welfare of the latter place, and who, were they by such an arrangement to sustain loss from the right-hand pocket, but which (did your space permit) I have an abundance of matter to prove is impossible, would but find the deficiency restored, with ample interest, into the left. To obtain a harbour at Brighton, there apparently seems no other chance than through the medium of a public company, with, possibly, a grant of aid from government, whose interest in endeavouring to accomplish the recommendation of the commissioners whom they appointed to survey the coasts, and report their opinion, at a cost of about 200,000*l.*, instead of two millions, for each capacious harbour, might prompt them to contribute their assistance for the testing of a principle of such important national advantage, if found effective in its operation. To induce the formation of such a company, there must be a rational ground of expectation for the realization of an adequate income; and for the obtainment of such an income, the harbour must be made at least partially mercantile. To make out an estimate of the probable disbursements and receipts I freely acknowledge myself incapable, and the task is probably such an one as but few, if any, are capable of accomplishing: I will therefore content myself with pointing to a few of the sources from which I conceive a mercantile income may be derived from vessels of greater burthen than can or will enter the port of Shoreham. 1. Occasionally from East and West India vessels, which, meeting with adverse weather in the Channel, would prefer entering the port of Brighton, landing their goods, trans-

mitting them to London by railway, and receiving in return their outward-bound cargoes, rather than risk the dangers of the Channel passage to and from the Thames, be subject to the loss of time, and incur the various navigation charges incidental to the extra voyage. 2. At all times, too, I think there might be a reasonable expectation of the landing and embarking a great portion of the oriental and other passengers; instead of its being effected at Spithead, as heretofore. 3. Wines, brandies, fruit, and grain, from the south of France, both for local consumption and transmission to London. 4. The fruits and wines of Spain and Portugal, the Mediterranean and Turkish fruits, and various descriptions of southern and western produce, that almost daily pass by our town, might from the same motives be prompted to yield and receive their cargoes in the new-found, deep, and commodious port. With inducive moderate charges for entry, these different branches of commerce might furnish a large income, in conjunction with such as is to be derived from other sources, such as post-office and passenger packets to various quarters, yachts, pleasure-boats and fishing-boats, &c., all which would also contribute their quota to make up the requisite amount.

Another powerful motive which, it appears to me, should influence all the inhabitants and possessors of property in Brighton to endeavour to obtain a partially mercantile harbour for the admission of vessels of the class referred to is, the additional support which the transit of their cargoes and passengers to and from London would afford to the Railway Company, in the welfare of which company I conceive the majority of such persons are deeply interested, for in the proportion to which the prosperity of that company is raised will be the enhancement of the value of the town property, and the general improvement of trade. In conformity with these views, and to facilitate the conveyance of such cargoes, not only to and from the terminus of the railway, but also for the conveyance of such cargoes or portions of such as may be landed for local consumption, and to obviate the chief objection of the inhabitants to a Brighton mercantile harbour—the conveyance of the cargoes of merchant vessels across and along the Marine drive, I will proceed to the discussion of the next subject connected with these views.

IV. *The Situation and Extent of the proposed Harbour.*—In the perspective design now exhibited at the Town-hall for public inspection, and of which the prefixed drawing is a reduced copy, I have shown the Chain Pier as situated in the centre of the projected harbour, and the length of the southern breakwater as 3,000 feet. As I have not had time to measure off 1,500 feet to the westward of the pier, I am not prepared to say in what relative situation the western breakwater would stand to any particular part of the front of the town, in an opposite line, agreeable to the design. But, as the proposed extent of such harbour was but suppositive as to what might be requisite, and had no reference to its partial mercantile appropriation, I have concluded, upon reflection, that, the better to subserve the latter purpose, it would be best to place the western breakwater immediately opposite to, and in a line with, West-street, and to appropriate its causeway exclusively for the landing and embarkation of goods, a double set of iron rails being laid down for their transit. I next propose that a tunnel should be formed beneath the centre of West-street, and, crossing the King's-road, that its mouth should open on the causeway of such breakwater. In continuance from West-street I propose that it should pass across and beneath North-street, and continue its progress beneath the centre of the new street about to be built by Mr. Thomas Cooper, builder, of this place, and its northern mouth open in that part of the Railway Company's grounds which to them may appear the most suitable. For the conveyance of goods from the harbour to the several parts of the town, intended for local consumption, and also for the conveyance of goods arriving from London by railway for a similar purpose, I propose that radiating tunnels from such main tunnel should be formed, for the delivery of such goods, in the most convenient and suitable situations which might be found for general distribution; by which arrangement a great portion of the inconveniences resulting from the conveyance of goods through and across some localities wherein its transit is highly objectionable might be avoided. Taking the western breakwater as the point to measure from, the eastern may be placed as far to the eastward, beyond the Chain Pier, as may be deemed desirable, either as relates to the requisite magnitude of the harbour, or the cost to which it might be deemed desirable to go; and as relates to the southward, there being a considerable breadth of level surface to the southward of the position which I have selected for the southern breakwater, a much greater space in that direction may be gained, without an increase in the depth of water, if considered necessary.

V. *Estimated Expense.*—Since writing the Address to "my fellow Townsmen," I have made as careful, and as correct an estimate, as the data furnished me, and the absence of many requisite data for the accomplishment of such an unprecedented work will

enable me to do, and after having made a liberal, and, I conceive, an ample allowance for contingencies, I find the amount for the execution of the work to the extent of the design furnished, will be about 150,000*l.* The dimensions of the work I assume to be as follows:—about 3,200 feet from the esplanade of the chain-pier, to the lighthouse, in the centre of the southern breakwater, the length of which is about 3,000 feet, and the width of the harbour from east to west at the shore end, is about 3,400 feet, furnishing an average area of about 10,240,000 square feet. On a subsequent calculation of what would be the cost by continuing the eastern and western breakwaters of the same length, and by lengthening the southern breakwater to the extent of a mile, and thereby furnishing an area of about 16,896,000 square feet, I find the amount about 200,000*l.*

VI. *The need in which Brighton stands of a harbour, to enable her to maintain her supremacy as the queen of watering places.*—The town of Brighton has hitherto indisputably maintained and well deserved the enviable title which has been universally conferred upon her. Containing the marine pavilion of royalty—situated at the shortest distance of any sea-girt town from the capital of the empire—enjoying the advantage of a railway, which shortens the time of transit between each place to an average of about two hours—possessing a broad and well-conditioned marine drive of about a league in length—provided with wide and well-kept esplanades, the eastern commanding a lofty view of the broad expanse of waters to the south, and the western more lowly, yet more congenial to the taste of many, fringed with a green sloping bank of turf, that intervenes between its finely gravelled walk, and the blue ocean that nearly laves the grassy swath—gifted with a chain pier, that furnishes an agreeable promenade, and in fine weather, a most convenient platform for embarkation and debarkation, on and from the several packets that now do, and in future may, call to receive and discharge their freights;—graced with numerous mansions fit for the residence of princes;—with scarcely a street which is not well paved, well lighted, and well drained;—and, in fine, adorned with pleasing and varied natural and architectural beauties; replete with every comfort and convenience; remarkably cleanly and healthy; enjoying a pure atmosphere, bracing breezes, excellent bathing facilities, and every agreeable incentive to wholesome exercise and rational recreation. But with all these and many other unenumerated advantages, we are sadly deficient in marine scenery, and the means of gratifying a very large portion of our visitors, who are naturally partial to the scenes of naval and mercantile activity. Often from the eastern to the western horizon, not a single ship appears to grace and enliven the weary waste of waters, and when they pass, it is at such a distance, that they seem as if dreading approach to the dangerous shore. We are besides exceedingly deficient in natural and artificial security in time of war; and very inadequately supplied with all those resources for an extensive intercourse with the Continent and other places, which some of our rivals so eminently enjoy, among which, the most prominent is Southampton.

Much inferior as Southampton is to Brighton in the number, magnitude, and splendour of its buildings, and those internal arrangements and attractions, which have hitherto rendered Brighton so far superior to it as a fashionable, comfortable, and pleasant watering-place; yet it is situated in a warm, soft, and luxurious climate; environed on three sides with a most luxuriant country, and graced in front, with a deep, capacious, and most convenient harbour, bearing on its glassy bosom, a multitude of the magnificent emblems of our naval and commercial resources. Recently too she has opened wide her portals, both northern and southern, for the admission of all the blessings which commerce can bestow: a railway on the one hand, leading direct to docks on the other, connecting this comely branch by a three hours' railway communication, with the vast trunk of this powerful empire. Commerce is conducive to population and to wealth, and population and wealth to luxury; and luxury to every conceivable improvement; and with these natural and adventitious advantages, who can say that she is not in a fair way to carry off the palm of victory, and wrest from us, that proud and distinguished appellation which our town has hitherto so long and deservedly enjoyed, provided we rest satisfied with our present attainments, rely supinely confident on our acquisitions, and move not onward as competitors and leaders in that general and extensive race of improvement, which has so eminently marked the present age, as superior to its by-gone predecessors? And what other cause for jealousy do we possess? I well remember when I was young, our intercourse with France was maintained by three or four sailing packets, and generally well freighted, running between Brighton and Dieppe all the year through, (wind and weather permitting,) but since the introduction of steam-packets, this source of influx of visitors, has diminished to one solitary half-freighted steam-vessel, and that only running about five of the spring and summer months. Even this limited intercourse promises shortly

to become extinct from ten principal causes: The diminished time—distance from London to Southampton,—the very convenient port which Southampton possesses to embark and sail from,—its convenient, commodious, and economical harbour, to prompt Steam Navigation Companies, to cause their vessels to resort to it;—the beauties of the place and its vicinity, to prompt Foreign and British travellers to pass through it,—its contiguity to the garden of England—the Isle of Wight;—its proximity to Portsmouth, our chief naval depôt;—the passage of its packets through the assemblage of naval shipping at Spithead,—the superiority of the town and port of Havre to that of Dieppe;—the delightful river navigation of the Seine from Havre to Paris; and finally the contemplated railway, which is to connect Havre with the capital of the French empire, to which so many of the English annually resort. What need we, to add to our natural advantages, to enable us not only to participate in the benefits resulting from such intercourse, hut to enjoy the superiority? I know of nothing hut a safe, convenient, and commodious harbour; for, possessing as we do the great advantage over Southampton of heing 27 miles nearer the metropolis hy railway traffic, and 29 miles nearer Havre, we have but to add this great desideratum to our varied and extensive acquisitions, and then we shall make another rapid and permanent stride in the maintenance of our supremacy. Much am I mistaken in the character, disposition, spirit and enterprise of the inhabitants of Brighton, if they do not simultaneously come forward and declare, that nothing but a defensive, safe, convenient, commodious and ornamental harbour, will snit their purpose, or that they will ever sit down passively content without it.

VII. *The Suitability of the Material, and the proposed Principle of Construction, for general adoption in the formation of Harbours, Piers, Jetties, Wharfs, Docks, Embankments, Groynes, &c., throughout the Kingdom.*—We now have iron ships, and why not iron harbours? Wrought iron, of which such vessels are formed, is liable to be destroyed by oxidation as well as cast iron; and if men can trust their capital, their persons, and their merchandise in vessels formed of that material, why should they for one moment hesitate to embark their capital in that which, if protected by suitable means, is not more subject to destruction than the other in salt water, and much less so in air? And what material is there to be found that is not subject to decay; and what can be found less subject than the combined materials which I have selected for the purpose, with the adoption of that suitable protection? It is said, that the iron railing round St. Paul's is constructed of Sussex manufactured iron; but where is the man living, that can remember its manufacture or erection, so as to be able from personal knowledge to record its durability? True it undonbtedly is, that this railing having been so many years exposed only to atmospheric air, and distilled water in the form of rain or snow, the action of such elements must he widely different from the action on cast-iron immersed in salt water; but where is the wood to be found that would have lasted thus long, exposed to the same elements in the same situation as that railing? And by parity of reasoning, where is the wood to be found for piling and bracing that is equally, or a fifth part so durable as cast-iron under water, protected or nnprotected? But I propose protection from the action of such water, as well as the aids of science (which I now invoke) will enable, and without which, if the judgment of an cxtensively experienced and well-informed person is to be relied on, (of which I have no reason to doubt,) such plates would last half a century, and a proportionably longer period with protection, in the ratio of the efficacy of the method adopted. And where are the wood piles, even when studded with wrought-iron nails, and coated with gas-tar, to preserve them from the destructive ravages of sea lice, (which improvement is now adopted for all the new piles, which are occasionally substitnted for those that have been thus destroyed,) that will stand for a period in any way approximating to the dnrabillty of cast-iron?

Should there he any doubt on the mind of any one, as to the shortness of the durability of wood piles withont such an expensive protection, let them go to the Chain Pier, to Shoreham harbour piers, and to our groynes, and examine the condition of some of those pilcs, not only as relates to the decay of that portion which is immersed in sea water, from the devastation occasioned by sea-lice, bnt the decay also of that portion which is above water from the effects of the dry-rot.

Or let them visit and revisit my model at the Town-hall of this place, and inspect specimens taken from two piles, one of fir, which has been fixed but for the short term of three years, and the other of beech, of five or six years' standing only, and let them judge, from the extensive ravages committed on them by sea-lice, if any unprotected wood structure would be either safe, suitable, or ultimately economical; and if protected, let them ask themselves or others the question, whether the additional cost of such protection will not render the immediate cost of the structure of far greater amount than the material which I have chosen, and whether

the customary external coating will preserve it from the destruction of the dry-rot within? With a view to ascertain the probable durability of cast-iron pipes constantly immersed in, or filled with, salt water, I have made inquiry at several of the principal baths in this town, how long their cast-iron suction-pipes last, sound and good? These pipes are laid for a considerable way under ground, and extend some distance into the sea; they are subject in some parts to external friction from the rising and falling of the tides, from the beating of waves, and from the collision of sand and gravel; they are, besides, always full of water, and subject to the internal friction of such as is drawn through them, as well as any action which such water is capable of producing on them: and, moreover, they are laid down without the least internal or external coating or protection. The answer received from Mahomed's bathing establishment was, that their pipes have been down twenty-two years, and there is no apparent defect or deterioration in them, and that they are still perfectly effective in operation. At Wood's baths, I was informed that the cast-iron pipes leading from their establishment to the palace had been down twenty-five years, and were still found in operation as effective as ever; nor were they aware of any decay in them, although they were constantly full of salt water, and that subject to continual change. At the other baths, their pipes had been down a shorter period, but all were in good condition. I have also consulted the oldest iron-founder in this place, and he states that there is a great difference in the quality of cast-iron, and that he would engage to put down cast-iron pipes, immersed in salt water, of such a quality as should last a century. The medium of protection which he recommends as preferable to any is, an admixture of boiled linseed oil, red-lead, and lamp-black.

Not having yet had time to make out plans and estimates of the probable cost for a definite amount of work with such materials, to enable others and myself to appreciate the comparative value of the system, against such modes of construction as are usually adopted for works comprised under the heading of this last subject of consideration, I am not prepared to furnish to the public that information which some may feel desirous to receive; but should any parties feel a wish to ascertain the cost for any particular work, I doubt not, but that on application with the requisite information connected with the work required to be performed, I shall be enabled to furnish them with what they need.

I am fully aware, that to solicit the insertion of so long a communication to occupy your valuable space, on a subject, the greatest portion of which can be but of local interest, may justly be considered intrusive, yet, as the appropriation of the materials and the adoption of the principle recommended, may some day become of extensive application, I trust that the subject may also be found of general interest, and the expectation be deemed a sufficient apology for the request,

And am, Sir, your obedient servant,
GEORGE ADOLPHUS WIGNEY.

Brighton, February 19, 1842.

PROGRESS OF FOREIGN SCIENCE.

[We have made arrangements for giving, in a series of articles under this head, early notices of all the more remarkable discoveries, inventions, and improvements of our continental neighbours; and as the articles will be original, and procured at some cost, we hope that such of our contemporaries as may avail themselves of any of them will have the candour to acknowledge the source to which they are indebted.—ED. M. M.]

FRENCH ACADEMY OF SCIENCES.

M. Poncelet, whose works on Mechanics have made his name celebrated in England, is President of the Academy for this year; and M. Dumas has been elected Vice-President.

Resistance and Wear of Roads and Carriages.

A commission, named by the Academy, consisting of Arago, Poncelet, Coriolis, and Piobert, have reported on several memoirs presented by M. Morin, on the subject of the resistance to draft in wheel carriages, and the wear which they produce on roads. The subject is one of great importance to the engineer, and has occupied the attention, amongst our own countrymen, of Edgeworth, Rumford, and Macneil; and on the continent, of De Gerstner, Navier, Müller, Kronske, Fuss, and others: none of them, however, has, as yet, succeeded in developing experimentally the mathematical laws of the subject, nor has the present author been more successful. His results, however, are considered by the reporters as of considerable practical importance.

The report is by far too voluminous to be given at length. The principal results stated are as follow:—

1. The resistance to rolling produced by different sorts of ground, (or road surface,) in carriages, is proportionate to

the pressure, and inversely as the diameter of the wheels.
2. The wear of the road is greater in proportion as the wheels are smaller.
3. On roads of compressible materials, as earth, sand, gravel, &c., the wear and the resistance to rolling decrease in proportion as the breadth of the wheel-tires is increased, and with all carriages is independent of the velocity.
4. On paved roads, or ordinary stoned roads, (*en empierrement,*) the resistance is nearly independent of the breadth of the tire, within certain limits, and increases with, and is proportional to, the velocity. The augmentation is less as the carriage is better hung (*i. e.* on springs) and the road more firm. At slow speeds, the resistance is the same for springed and unspringed carriages.

These are results of M. Morin's first memoir, some of which, it may be observed, do not agree with those admitted amongst British engineers. The second memoir contains his results as to the relation between the form of wheel and wear on the road. The mode of experiment adopted was that proposed by M. Navier, viz., the causing the same load to pass repeatedly over the same track of road, and observing the depression. This method was proposed by Navier in an able work published by him in 1835, and little known to Englishmen, entitled "Considerations on the Principles of the Police of Wheel Carriages."

M. Morin's principal results in this Report are—

1. With equal loads, narrow tires degrade roads more than wide ones; but with loads of 5,500 kilograms, and tires of 0·12 metres wide, the advantage of width is a maximum, and beyond this there seems to be no use in augmenting the width.
2. Another set of experiments indicate that, with loads proportional to the width of the tires, the widest tires injure the road most.
3. With equal loads and widths of tire, greatest injury results from the smallest wheel.
4. The same load carried in two two-wheeled carts produces less injury than in one four-wheeled wagon.
5. A springed wagon, at a trot pace, produces as little injury as an unspringed one at a walking pace. The speed in the former case was 3½ leagues per hour.

The remainder of the memoir is occupied with experiments on the shock and resilience of elastic bodies, and is not so important. The difficulties of this subject, as an experimental one, are very great; and perhaps results taken from the actual working of certain suitable and defined lines of road for a long period, arrangements being made for the purpose, would be more likely to give correct information than any experiments made in the manner of M. Morin.

Water-proof Cloth.

M. Menotti's invention of a soap in solution, for the purpose of rendering cloths water-proof without stopping their pores to air, &c., was reported on favourably by a commission of the Academy, in January, 1840, and the subject has been again brought by him before this body. This invention of Menotti's is nearly, if not quite identical with that patented by Raper in this country, and both are alike useless. It is quite true that either of these plans, (if they differ,) or any one of many others of long anterior date, will enable cloth to resist water gently poured over it, but a very little rubbing or *sopping* of the cloth sends it through the fabric; so that, although a coat might bear a shower, say on the shoulders, it would wet through under the arms, &c., in a short time.

The principle of all the methods consists in fixing in the pores of the cloth either an oily matter, by decomposition of a soap, or an extremely divided powder, having little or no affinity for moisture. As yet, no water-proof cloth exists but that made so by India-rubber, or at least, none that will remain so.

Manna.

A substance has recently been introduced into commerce as manna, in France, but which does not possess all the properties for which that drug is valued. It is questionable whether the new substance is an artificial or natural product; and it has been examined chemically by Pelouze, and optically by M. Biot, by means of polarized light, according to his own peculiar method.

Mannite, the peculiar proximate principle to which manna (which is a secretion from certain trees of the genus *Fraxinus*) owes its efficacy, has scarcely any rotatory power on the polarized ray. The

solution of manna, however, like that of dextrine, or starch modified by the action of acids, causes the ray to deviate to the right of the observer, which arises from its containing a quantity of fermentable sugar. This renders the optical examination of this new sort of manna not quite decisive, as its effects on light are similar. This substance consists nearly wholly of fermentable sugar, very analogous to that produced by the action of acids on starch; and although it cannot be pronounced certain, it seems not improbable that this new sort of manna is, in fact, so made.

The Galvanometer.

M. Melloni has communicated to the Academy of Sciences a new method of varying at will the sensibility of his galvanometer, and, when desirable, greatly increasing its power of measuring minute electrical charges, and, by their means, minute changes of temperature. The paper is too long for extraction in an intelligible form, but will be read by electricians with great interest.

Causes of Explosion in Steam-boilers.

The formation of explosive mixtures of gas by decomposition of water in iron boilers, when in contact with red-hot plates, has been repeatedly urged as a cause of explosion; and as repeatedly has it been shown that, although possibly hydrogen might be thus produced, an explosive mixture could not, as the oxygen is not set free, but taken up by the iron while it oxidizes. M. Jobard, Director of the Museum of Manufactures at Brussels, has published a paper, in which he reasserts this to be a true cause of explosion, and gets over the difficulty as to oxygen by saying that atmospheric air takes its place; that, in fact, water cannot be decomposed unless the water be low in the boiler, which cannot happen unless the feed-pump be out of order, that is, not pumping water, but *pumping air*, into the boiler.

He explains, then, the ignition of the inflammable compound to arise either from the contact of the red-hot plates, or from an electric spark produced by opening the safety-valve, and the steam rushing out.

It is now well known that a discharge of steam is accompanied with a powerful disturbance of electrical equilibrium; but it is not so evident how this is to produce a spark, in such circumstances as to ignite the supposed issuing volume of gas. It requires a bar of iron to be nearly *white-hot*, before it will ignite an explosive mixture of gases. A more likely source for the air would be, apparently, that it is introduced into the boiler in *combination* with the feed-water, and there evolved on its being heated.

Some curious examples of explosion are cited by M. Jobard; among others, one of a boiler at Ghent, which was blown up while the man-lid was off, and the boiler about to be cleaned out. On the whole, as there is no doubt whatever that iron, aided by high pressure, (as, for instance, Perkins's Hot Water Apparatus,) will decompose water at temperatures even below ignition, it is quite possible that some explosions of boilers may have been due to this peculiar, but certainly most unlikely, combination of circumstances; while there can be equally little doubt that the vast majority have arisen from simple pressure of surcharged steam, a cause, however, which, M. Jobard will not admit under any circumstances; for he says, a boiler gradually overpowered by steam pressure rends at the joints, which first open, and give vent to water and steam. A complete treatise upon the causes of boiler explosions is yet a desideratum: every author hitherto has had some favourite crotchet to support, besides the main point of the matter.

The Artesian Well of Grenelle.

In a letter to M. Arago, Mr. Combes gives his opinion as to the causes of the singular flattening of the copper tube lately put down into the bore by M. Mulot, and which has caused so much trouble to get up again. It is pretty generally known already, that, after more than 600 feet of the copper tube intended to line the well had been got down, without any accident, suddenly, in one night, above 300 feet in length of the tube became compressed together flat, and twisted in various directions, grasping and retaining a spoon which had been before lowered down into it. The following is the theory of the phenomenon given by Mr. C. The inside of the jumper-hole had been previously lined with sheet-iron, at intervals, to support its sides. The water of the upper chalk continued to discharge large volumes of sand, which are supposed to have filled up and got wedged between the two tubes, and so stopped up all egress to the water in that way. As long as the water stood at the same level

inside and outside the tube, the pressures would balance each other, and no injury could result; but the water from the bottom of the chalk would carry up great quantities of solid matter also, and be subject to frequent stoppages, obviously caused by breakings-down, or wedging of particles in motion in its subterranean ducts. Mr. C. supposes, then, that the flow of water in the inner tube was arrested; that the level of the water in it fell, temporarily, much below that due to the pressure on the outside of the tube; that the water of the upper chalk was then *corked up* between the tube and the sides of the well; and that at this moment the sides of the copper tube were crushed inwards.

The portion of the tube crushed was from about 300 feet from the surface to about 600 feet lower.

New Application of the Electrotype.

M. Peyré, of Versailles, has proposed an application of the electrotype process which seems likely to be of value, viz., to the multiplication of accurate graduated instruments. It is obvious that, if one perfect graduated scale of metal can be had, without injury, we may electrotype others on it, and others off them, *ad infinitum*. The costliness and rarity of good graduation is well known to those who are at all concerned with instruments of precision. As a proof of the power of the process, very ample details of which M. Peyré gives, he states that a Daguerreotype plate, having a faint image of the Christ of Michael Angelo, gave him copies in copper, in which the design was as apparent as in the original.

MR. WILLIAMS'S SMOKELESS FURNACE—REPLY TO MR. ARMSTRONG.

Sir,—As Mr. Armstrong continues to repeat his unwarrantable statements, I must beg permission to make a short reply. He now attempts to neutralize the effect of his admission that his report was "founded on erroneous data." The only answer I shall make is, that I have the fullest confidence in the statements made by the solicitor, a wholly disinterested party. It is quite true, the letter of recantation was not written by Mr. A. himself. I never said it was: and your explanation, in the note attached to Mr. A.'s letter, renders any further observation on this point unnecessary. My assertion was, that he had no grounds for stating that his conviction of the supposed injurious effects of my mode of admitting air to a furnace was, "forced upon him by a careful and unprejudiced examination of *several furnaces* constructed by Mr. Williams himself." His now triumphant answer is, that indeed he had seen *one* which was erected by the late firm of Brocklehurst and Company, and which, after a hasty examination, he ridiculed as a mere "peep-show affair," (see *Mec Mag*, April 17). Now, this statement alone, so different in substance from his "long attention, and careful examination of *several*"—is a sufficient refutation. But as to this one furnace to which he refers, I have to state,—1st. it was not constructed by me, and in several respects differed from my instructions; 2nd, it nevertheless was successful in its operations; and 3rd, it never caused any injury—its internal action completely negatived the expanding and contracting, heating and cooling process—and it ever continued to work satisfactorily. Thus, if the report was in any way influenced by the action of that furnace, it should have been the reverse of what it was. The object, however, was to throw discredit, in the garb of a matter-of-fact report, on my principle of admitting air to furnaces. I am sorry here to have it to say, this is no solitary instance of a prejudging determination to condemn, without enquiry, and on the part of those whose real interests would suggest the most rigid impartial examination. But the main allegation in Mr. A.'s letter is, that I threw the responsibility of the action of my furnace, in the case of Messrs. Hamnett's boiler, on my agents. This, Sir, is the very reverse of the fact; for, as it was important to me to disprove Mr. A.'s statement, that my plan of admitting air was, and "ever would continue" to be injurious, I adopted the most decided measures on that head. I wrote several times to Mr. J. Woodiwiss (the acting partner) on this subject: and the following extracts from my letters will set this matter right:—

My letter of the 15th of December last, states, "I will, at my own expense, put the furnace in operation for any given number of days, which may be deemed advisable for testing the value of my system, and of proving to your entire satisfaction, that it is absolutely impossible

to injure a boiler by any operation of my system, so long as it is preserved in a proper state of cleanliness and with a due supply of water. The only condition I shall require is, that a water gauge be placed on the boiler, and by which the fireman can ascertain whether there is a sufficiency of water in it: and further, that until you are satisfied as to the safe working of the plan, I be allowed to have a confidential person to prevent any neglect," (I might have said—or foul play,) "as touching the supply of water. I will give you any guarantee as to the safety of the boiler." This, I think, will be admitted to be the *experimentum crucis*: for, had I failed, and had Mr. A.'s theory been correct, the question would have been at once and for ever settled, and to my discomfiture. Mr. Woodiwiss should at once have accepted the proposal, and Mr. Armstrong have advised it, as the best test to which his theory could have been subjected, and the surest annihilation of mine, if erroneous. But this offer, to take on myself the risk and responsibility, was declined, and uncourteously so. This was at least suspicious.

In my letter of the 27th of December, I said—"I repeat my proposal to re-open the air-pipe, and show you that no possible injury could be sustained by the admission of air, as alleged by Mr. A." Again—"I undertake to make this application without any expense to you—without any charge for patent right, and with a guarantee against *any, and all injury*, from such admission of air." I trust, Sir, this will be a sufficient answer to the allegation that I threw the responsibility on others. Suspecting, however, that there was some understanding between the parties, I brought this to the test, by adding, "If you refuse me, the world will say you have consented to the erroneous statement, and are, in fact, supporting Mr. Armstrong in his unjustifiable attempt to injure me." My last letter to Mr. Woodiwiss states that his refusal was perfectly satisfactory, and the public would know how to appreciate it. Mr. A. states, that I was present, and a "witness of its failure." I was present, and, on the contrary, witnessed its success. The alteration was one suggested by Mr. W. himself, namely, the stopping the action of Stanley's feeding apparatus, and which I at once had objected to, as defeating my principle; seeing, that by the action of Stanley's feeders, too thin a fire is maintained on the bars, and so large a quantity of air is drawn in from the front as effectually to obstruct the action of the air introduced in the proper place—from behind.

Mr. A., very *naively* observes, that his statements have been "verified to the satisfaction of every one who has chosen to enquire of the proprietors of the boiler in question." No doubt of it. But what say those who have enquired of other, and disinterested, and unprejudiced persons? Have they enquired of the respectable makers of the boiler? Have they enquired of those who have boilers in action on precisely the same principle—the Liverpool Water Works Company, for instance? For, if the theory be correct, it must produce similar effects under similar circumstances.

Now, there is a very important and useful consideration arising out of this discussion, and which, otherwise, would be very unsuitably placed in your scientific Magazine. I allude to the adoption of means for judging correctly, how far any system of combustion, or "smoke burning," or arrangement of furnaces, may be effective or otherwise; and which would enable the owners—the really interested parties—to judge for themselves, independently of the theoretical views and imaginary statements of patentees. As this is a matter of great practical value, I propose, (though out of the course I had determined on,) in my next communication, to go into the question, and show its absolute necessity.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, March 7, 1842.

Erratum.—In my last communication, page 187, line 19, for, "from 40°, to 476°," read "from 400° to 476°."

STEAM NAVIGATION OF THE ATLANTIC—LIVERPOOL AND BRISTOL LINES.

Sir,—I have just perused your extract from the *Bristol Magazine* in your number for January 1st, respecting the steam navigation of the Atlantic, and the rival lines of Bristol and Liverpool; and although I think with you that it is true "in the main," yet still it contains much exaggeration, and many of the facts have

been greatly distorted for the purpose of serving "local interests."

1. With respect to the conveyance of North American mails:—the Editor he *Bristol Magazine* would seem to insinuate that the government had made a "patronage job" of it to serve their own interests, and that they had absolutely thrown away 35,000*l.* of the public money. Now, the facts are these: the government having determined on carrying the N. A. mails by steam, pitched upon Liverpool as the best port in the United Kingdom for the packets to take their departure from, being from its situation nearer to, and in direct communication with Manchester, Birmingham, Sheffield, Glasgow, &c., where about nine-tenths of the letters go from, and also from the great number of American vessels that enter the Mersey, the chief seat of our American trade. Having decided on Liverpool, the contract for conveying the mails was offered publicly, and the British and North American Steam Packet Company offering the most favourable terms, the contract was given to them, and not to a company with a single vessel, sailing from a second-rate seaport to a foreign one.

2. With respect to the "wisdom of the government" in thus conferring the contract upon Liverpool:—the government had not only the "exigencies of the post-office service" in view, but looking rather farther than the Editor of the *Bristol Magazine*, they had also an eye to the welfare and benefit of the nation at large; for, in the contract, it was expressly stipulated, that the company should provide four steamers of certain dimensions; and, that in case of war occurring with any foreign country, these vessels were to be manned and armed in the same manner as the navy steam-frigates, and were to be placed at the absolute control and disposal of the government during the continuance of such war. Even if the government had only the "exigencies of the post-office service" in view, what is the result? As far as regards the "speed" of the vessels, we find that the Halifax boats, in fine weather, have usually made the voyage home from that port to Liverpool, in from ten days and ten hours, to eleven days; while the *Great Western* takes from thirteen to fourteen days, although Halifax is many degrees farther to the northward than New York, and consequently the former boats have to contend with the severer weather, which is generally experienced so far to the northward. As to the remarks respecting the punctuality of the *Caledonia*, *Columbia*, &c., their detention when they have been detained has always been satisfactorily accounted for, either from having experienced severe weather, which, as I have before observed, is not so often felt, and never so severely on the voyage from New York, as on that from Halifax, having met with icebergs, which is frequently the case, or else from having been detained by the government authorities to bring home despatches of importance.

3. With respect to the Editor of the *Bristol Magazine's* remarks regarding the voyages of the *Britannia and the Great Western* in October last, the causes of the delay of the former vessel are so well known, that it would be quite superfluous for me to make any remarks respecting it.

4. With regard to the delivery of letters *viâ* Bristol:—if both the steamers were off Cape Clear at the same time, we will allow that it would take the *Britannia* even ten hours longer to deliver her letters in Liverpool, than it would the *Great Western* hers in Bristol; letters from Bristol are absolutely thirty hours in reaching Liverpool by the regular post, that is, if they are posted in the former town on the 21st, in time for the evening despatch, they are not delivered till the morning of the 23rd in the latter town, thus losing *twenty* hours at least in the delivery. If the difference is so great with respect to Liverpool, it follows that it must be much greater with respect to the other towns I have mentioned.

I have drawn my letter to such a length, that I have hardly room left to make any further remarks. Still, I cannot conclude, without noticing the absurdity of supposing that government would give the contract to a company with a single vessel to convey mails of such importance; when, if an accident occurred to the vessel, the communication between the two countries would have to be suspended whilst she was undergoing her repairs.

Hoping, that in justice to this port, you will insert the foregoing remarks in your able and well-conducted Magazine,

I am, sir, yours very truly,

A CLERK.

Liverpool, February 26, 1842.

PREVENTION OF SPONTANEOUS COMBUSTION ON BOARD OF VESSELS — MR. WILLIAMS'S EXPERIMENTS.

Sir,—I was very much pleased with the suggestion (p. 154) of placing pipes with small holes in them to admit air through the bulk of coals in steam-vessels; but I think, if the upright pipes were carried lower, and joined to other tubes running horizontally, it would be still better. About eight years ago, I made a very complete model upon the same principle; but my idea was, to prevent the heating of corn and potatoes in vessels, as it is a most remarkable fact, that a large quantity of both articles is completely wasted, if the voyage happens to be a long one. I took some trouble to show it to a few individuals whom I thought it would benefit; but no—it was all very well in its way, but the damaged food was no loss to them, and therefore they did not care about it. In carrying out my plan, I made a large box, something like the hull of a ship, with a double bottom pierced with small holes, with tubes going through the corn to the space between, and by forcing air with a piston down the tubes, it rose upwards again through the grain; and it was astonishing to see how soon wheat, well damped before putting into the box, was dried. I proposed that granary floors should also be done in this way, as it would save a good deal of turning; but the expense seemed to be a complete obstacle to any improvement in that quarter.

While writing, I cannot help congratulating Mr. Williams on the able manner in which he has detailed his several experiments, proving to a certainty the old saying, that the three-legged pot boils a great deal sooner than one that has no legs at all. Indeed, I have often observed, when a boy, the steam rising up with great fury in three places perpendicular to the legs. But it is not the man who sees such things and thinks no more about them that benefits mankind; it is he who turns them to real practical use, and thereby adds new stores of knowledge to the book of science.

I remain, Sir, your most obedient,

J. W.

THE HADDINGTON MARINE STEAM-ENGINE.

Sir,—I observe, in No. 968 of your useful and interesting Magazine, a description of an engine, (called the "Haddington Marine Steam-engine,) by Mr. James White, and beg to inform you that, in the year 1827, I saw a pair of marine engines, constructed in London by Mr. John Hague, on the same principle: they were of 40-horses power, and were erected on board a vessel called the *Thames*, which traded between London and Yarmouth for a considerable period. The engines to which I refer were put into the vessel in the place of, and same space previously occupied by, a pair of rotary engines, (which were made by some other party, and were inefficient,) and they worked quite satisfactorily, until the vessel, getting old, was broken up. The only difference between the engines made by Mr. Hague and the *so-called* Haddington engines was, that they had an intermediate shaft, and that the air-pumps were worked differently, taking up less space. I have documents and sketches in my possession, made in 1827, showing exactly the same arrangement of a drag-link to supersede the necessity of an intermediate shaft, and also sketches of a plan for working the air-pumps, as described in the drawing of the Haddington engine; but these plans were abandoned in order to bring in the old air-pumps and working gear, (which had belonged to the rotary engines,) without any alterations.

With respect to the stuffing-boxes, I can speak from experience of their working, that there was no more difficulty in keeping them tight, than in engines of the ordinary construction; and the piston-rods, although working downwards, were lubricated easily by a very simple contrivance.

I am, Sir,

Your obedient servant,

ENGINEER.

March 4, 1842.

FIRE-PREVENTIVE PLASTER—COL. MACERONE IN REPLY TO MR. BADDELEY.

Sir,—In No. 967, our worthy friend and your most valuable correspondent, Mr. Baddeley, has poured out the phials of his wrath upon my poor bald head. Mr. Baddeley is very much mistaken in his phrase "the determined hostility with which Colonel Macerone has all at once attacked the fire preventive plaster." I, sir, have no cause or feeling of "hostility" towards it; I have never seen their prospectus, and know none of the parties concerned in it; and if I did, had I been injured or offended by any of them, I should deem myself "a false knave" to squeak my penny trumpet in depreciation of any useful invention. What I predicated was, that our most flimsy trembling floors could not sustain *any* kind of plaster without its being cracked and destroyed by the said elasticity. I have seen plenty of floors covered with stucco as hard and polished as

the finest marble, and walls of rooms also. At Venice the floors are of beautiful scagliola, often washed and rubbed with oil; but then, the construction is so stiff and solid, that a troop of horse would not cause a shake. The mansion of my uncle, Alexander Falconieri, at Tusculum, above Frascati, near Rome, had the walls of many rooms covered with a cement which has the whiteness and polish of the finest marble. Some are painted in fresco. Indeed, uncalcined marble powder is one of its chief ingredients. The floors were the same, and the only inconvenience is of disposing an *unwary* walker to fall incontinently on his or her back. So far from "determined hostility," I am glad to hear from so very competent a gentleman as Mr. Baddeley, that this cement is an accession to our means of security from fire. But I must remark, as a practical man, that the *under* surface of deal stairs is far more liable to be caught by the fire, than the upper; but I suppose the former will be plastered as well as the latter. The like may be said of the floor of a room *upon* which I have overturned a large grate-full of brilliant fire, which, without a drop of water, has burnt itself dead, only leaving a charred concavity in the boards. But all these things will no doubt be duly borne in mind by the "Fire-preventive Company," to which I desire all possible success and prosperity.

I have no shadow of a cause for depreciating the merits of the patent cement, although Mr. Baddeley hints that he *could* explain the "*wherefore.*"

In Italy, the rooms are all stuccoed from top to bottom, and the floors are either of large tiles painted, or of scagliola. The window curtains are generally of silk—the beds have none; the staircases are *all* of stone; so I can vouch that from 1806 to 1815, there was not a single house burnt in a city of 500,000 inhabitants. The same in Rome; the only "fire" during seventeen years, was that of a chimney in the house of my cousin, the Marquis Lepri, brother-in-law to Torlonia, in whose mansion, next door, a beam caught fire, or rather was charred by its stupid propinquity to the said chimney. I shudder when I think of the risk I ran on that occasion. I happened to be in the room at the time. I instantly nailed a wet blanket before the fire-place; then got on to the roof, and poured down several buckets of water. It was in February 1812, a hard frost. Part of the water spilt, covered the sloping roof *without parapets*, and formed a coat of ice. The least slip would have let me down into the street. The firemen urged me to come away, saying, that the soot would burn itself out, (and so it *ought* to do in a well-constructed chimney). I called out for a wet blanket; they, with the fear of the icy roof before them, would not *bring* it; so as of old, as the mountain would not come to Mahomet, Mahomet went to the mountain; I crawled to them for the wet blanket, stuffed it into the chimney, and the fire was extinguished. It shows how very little used to fires the Romans were, when this little incident of a chimney on fire was the topic of general talk for months after, and I was decreed to be worthy of nothing less than an *ovation* for stuffing a wet blanket into a chimney! The only damage I received was the breaking of almost every nail off my fingers in holding on to the ice-covered tiles.

But I must not forget to say a word on Mr. Baddeley's sneer at my chemical analyzing knowledge. I do not pretend to an *operative* dexterity in chemical analyzing operations. It is many years since I possessed a competent laboratory or apparatus. The instrument I used upon the little bit of the patent cement, was my tongue. I may have been mistaken as to that which I took to be "Roman cement;" but, as to the barrel of size, I not only saw it open, but amply smelt it. I attach no blame or deceit to this. As Mr. Baddeley most justly says, "neither can the materials of which the fire-preventive cement is composed, be of any great consequence, so long as it retains the fire-resisting properties." To this paragraph I agree "*totiis viribus.*" It appears from Mr. Baddeley's letter, that pounded slate is the basis of this cement. Now, we all know that the base of slate is the earth called alumina. My grandfather, the Marquis Macerone, possessed the alum works of La Tolfa, near Civita Vecchia, six miles from Rome, where slate is superposed on a volcanic crust of our earth. The rising sulphuric acid penetrating the slate, produces sulphate of alumina; or, what in commerce is called alum. The alum is extracted from the slate by exposure to the air and aspersions with water, which water is then boiled till crystallization of the alum ensues. 15,000*l.* worth of alum were thus produced from my grandfather's slate mines of La Tolfa every year. But it would take too much of your valuable space to talk of alum, slate, &c. So I will conclude, by assuring Mr. Baddeley, that he is mistaken in his view of the sentiments of

F. Macerone.

P. S.—A friend has just told me, that a gentleman to whom I am under many obligations, and whom, rather than injure or offend I would cut off my hand, has an interest in this patent "Fire-preventive Company." This intimation has just come in time to prevent

me from sending you a long comprehensive article, long since written on the subject. By the bye, Mr. Baddeley will not, I hope, deny that the day before the experiment in South Lambeth, I saw "with my own eyes," an open barrel of size. I attach no importance to the fact, but merely speak in defence of my veracity. Why should I have said so, if not true? I have no rival patent or interest. It would be desirable if you, sir, or Mr. Baddeley, would invent or compound some English word to signify the burning of a house. "Fire" applies to a pistol; to the fire in the grate, or in a lady's or gentleman's eyes. But the French have *incendie*, which applies alone to tenements burnt. By the bye, I once heard an English lady in Paris, scold, the servant, and tell him, "*Le feu est allé dehors!*" The man stared, and was glad to see that the grate and chimney-piece had not gone out for a walk along with the fire.

February 20, 1842.

NOTES AND NOTICES.

The Smoke Nuisance.—We are glad to find that this important subject is at length beginning to be seriously entertained by the authorities of the different manufacturing districts, and the practicability of its prevention as generally admitted; the Lighting and Watching Commissioners of Bradford, a short time since, appointed a committee, consisting of Messrs. Broadbent, Smith, and Walker, to examine the various patent rights, &c., and to report the result of their labours. These gentlemen appear to have been most assiduous in their inquiries, and their report must be highly satisfactory to Mr. C. W. Williams, in particular, to whose invention they pay this tribute—"By this apparatus the consumption or prevention of smoke is complete, and a saving of 25 per cent. in coal effected." The apparatus of Mr. Hall is also well spoken of, as well as those of Mr. David Cheetham and Mr. Billingsley; and the committee, in concluding their report, state their unanimous opinion to be, that the nuisance of smoke can be entirely prevented, and that attended by a considerable saving of fuel.—*Mining Journal.*

Safety Beacon erected in the Goodwin Sands.—The following interesting account of this structure is contained in a letter from Captain Bullock to Captain Beaufort, hydrographer to the Admiralty, published in the *Athenæum*: "In carrying on the survey of the Thames, it was found expedient as the work proceeded seawards, and the receding landmarks grew indistinct, to erect fixed marks on the different sands. The first of them was nothing more than an iron bar driven into the sand, with a flag-staff affixed to it. This stood but a tide or two, and was succeeded by various modifications of the same simple plan, stays being added to support the shaft: but in vain; the marks erected in this manner all yielded to the first gale of wind. It then appeared that some foundation was wanted to enable them to resist the force of the waves. To remedy this defect, the bar was fixed in a broad cross of wood, from the extremities of which chains were attached to the staff, and, after many trials, success was attained by this means. The results of the experiments above related, joined to the knowledge of the lamentable loss of life annually taking place on the Goodwin Sands, induced the persuasion, that since it was found practicable to fix a Beacon on them, it was an imperative duty to erect one calculated for the preservation of life. The Safety Beacon now standing upon the Goodwin Sands, may be thus described:—The Shaft, or Mast,—40 feet in height and 12 inches in diameter, is sunk into the sand, through a strong frame of oak, in the form of a cross, firmly secured by four long bars of iron, and laden with several tons of ballast, chalk, &c. The mast is also sustained by eight chain shrouds, in pairs, and attached to iron piles, 17 feet long, which are driven close down into the sand, and are backed by mushroom anchors, to prevent their coming home, or towards the Mast. On the Shaft is fitted an Octagon Gallery, capable of holding thirty or forty people, and never less than 16 feet above high-water mark; beneath the gallery there is temporary safety for twenty persons more. The Mast is also fitted with a light topmast, on which a blue flag (always at hand) can be hoisted, when aid is required from the shore, but which is kept struck, or down, to give the whole an appearance of a wreck, thus answering the double purpose of a Beacon of Warning and a Place of Refuge. Directions are given in eight languages, and bread and water with a small supply of spirits, are left upon the Beacon, properly protected from the weather. To the Beacon is also appended a chain ladder of easy ascent, as well as cleats to the Mast, and a large basket chair is kept in readiness, with ropes and blocks to succour the exhausted."

Cooking Carnelians.—The carnelian is a beautiful illustration of change. This beautiful gem embraces every colour, from the pale fine yellow of sulphur to the deepest crimson; its opacity varies from the dull and coarse texture common to other stones, to the exquisite fineness of garnet. But what is it in its state of nature, before it is dragged to the light of day? A dull, worthless, flinty substance, similar to the agate, varying in its colour, and, sometimes in its material. The ignorant native of India, who is no geologist—who knows not what philosophy means—but, simply excited by his cupidity alone, abstracts the worthless stone from the earth, and, placing it on some elevated spot, suffers it to remain on the surface of the earth for three years, at the expiration of which period, he boils the stone for several hours, in order to expedite the result, and to check its further changes. In the cutting we acknowledge Carnelian, one of the most becoming and beautiful ornaments of the female sex, although, from its abundance, but held in light esteem. Again, to anticipate the slow operation of natural causes, these uncultivated people inclose the unripe stones in a vessel of earth, and, in this state, expose it to artificial heat; thus, in a few days, the like result is obtained.—*Correspondent of the Mining Journal.*

Adams's Bow Springs and Spring Buffers are stated in a Hamburgh paper to have been adopted in the Hamburgh and Bergsdorf railway, and with great advantage as regards both "ease of motion and absence of noise."

City Fire Escapes.—At a Court of Common Council held on Monday, February 28, Mr. Lott wished to know whether any opportunity had occurred, for putting the *Fire-escapes* ordered by the Corporation, to the test? He wished to hear something upon the subject, which, although of such immense importance, seemed to have dropped into oblivion. Mr. Hicks, said that three escapes had been made, and the police commissioner and Mr. Braidwood of the Fire-brigade had been made acquainted with that fact. So much for Corporation progress!

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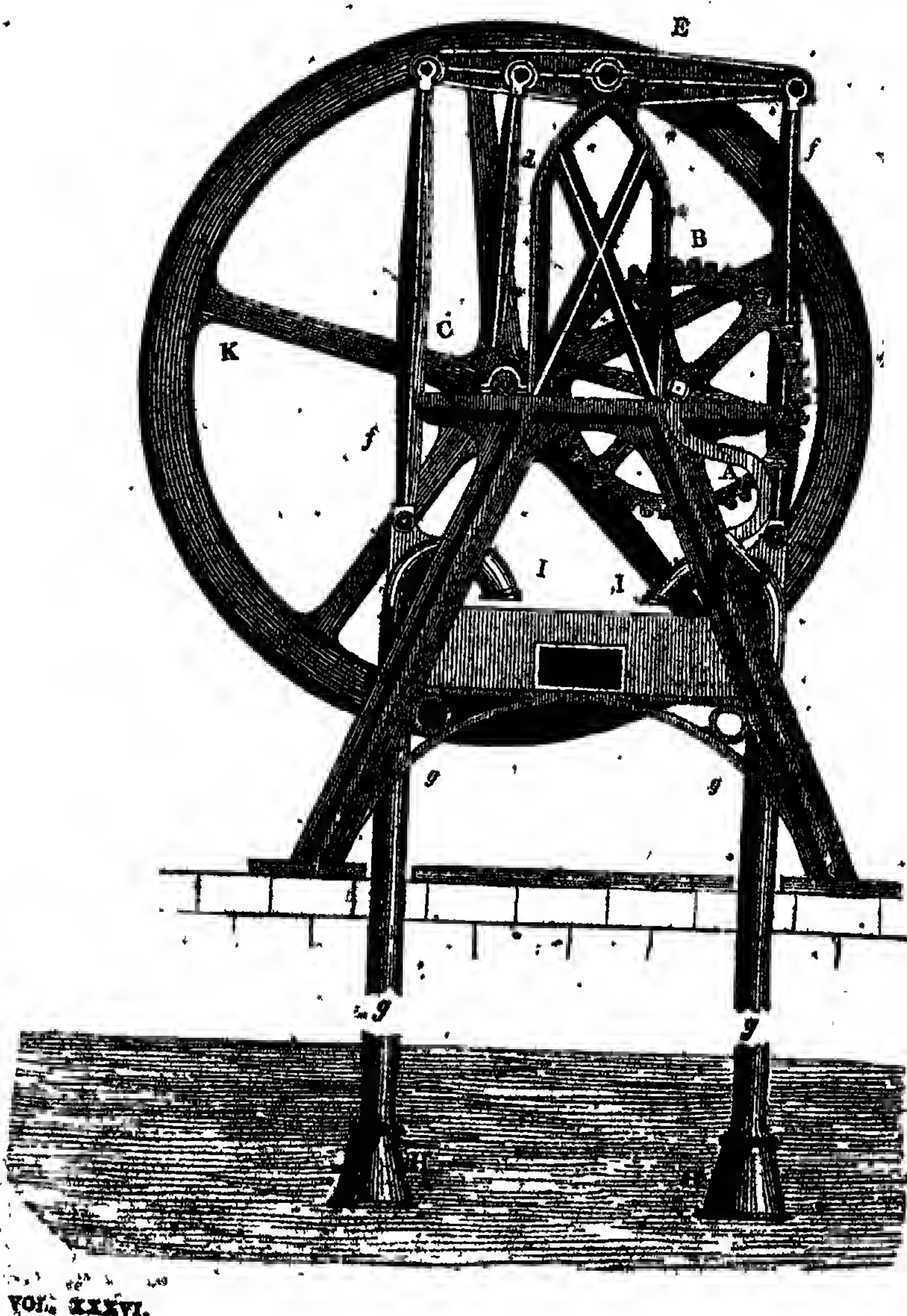
WALKER'S HYDRAULIC ENGINE.



Sir,—There is, perhaps, scarcely any matter in engineering science that has engaged so large a share of attention as *the art of raising water. The diversified expedients resorted to for this purpose*, prior to the invention of the pump by Ctesebes, and the attempts that have been subsequently made to improve upon this important instrument, would fill a goodly volume, replete with interest and instruction.

Without entering into any examination of the comparative merits of the present most popular contrivances for this purpose, I propose in this paper simply to complete what I began in your 34th volume, (page 377,) viz., a description of the novel and ingenious "Water Elevator," patented by Mr. Walker. In that communication I briefly described Mr. Walker's apparatus in its simplest form, and noticed its extraordinary capabilities—extraordinary, because, if that description had appeared anonymously, the whole matter would have been put down as a hoax! My plain unvarnished tale, however, having a name appended to it that was at least a guarantee for its authenticity, was received with some degree of attention.

So apparently mysterious, however, was the action of this novel apparatus, that curiosity was strongly excited respecting it. In illustration of this, I may just mention a circumstance that came to my knowledge. A party of gentlemen, in Suffolk, entered into a subscription to enable one of their number to come to town to examine and report upon this phenomenon. Accordingly, he waited upon Mr. Walker, who, in his usual candid and unpretending manner, exhibited the machine in operation, and explained the nature of its action: furnishing satisfactory proofs of all that he advanced. The gentleman saw, and wondered; he was of necessity convinced: but, said he to Mr. Walker, "you must please to let me have one of these machines to take back with me; my report alone will be unavailing—seeing is believing—but nothing short of seeing will carry conviction in this business."

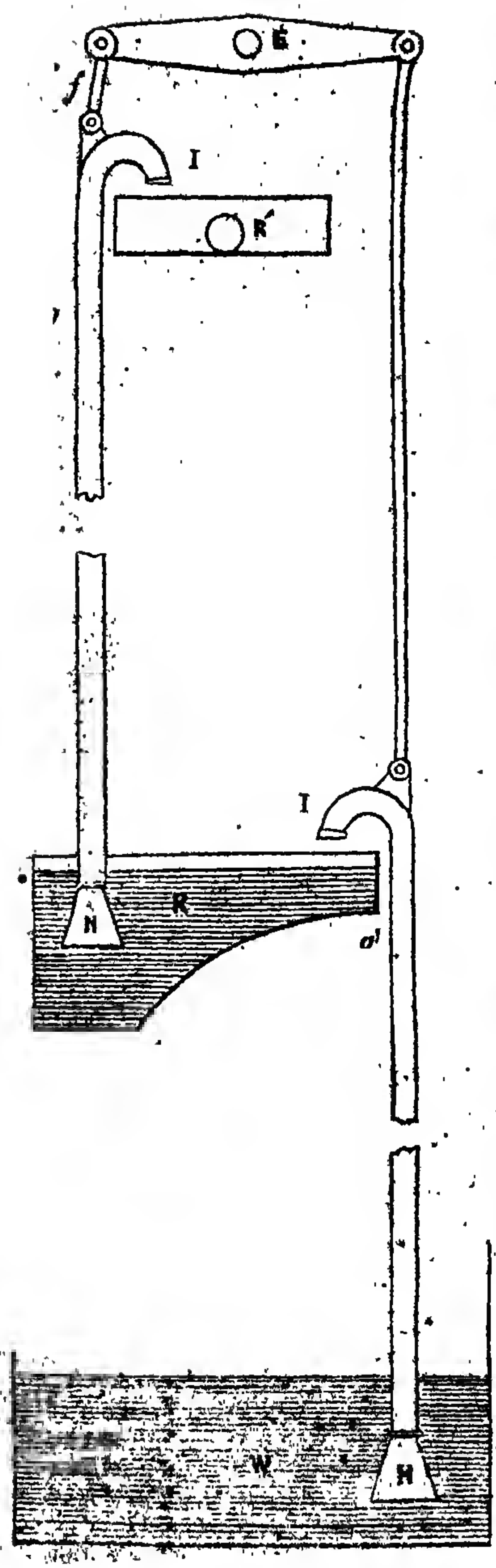
So paradoxical is the performance of Walker's hydraulic apparatus, that skilful and intelligent engineers have been completely astounded by it, and have been wholly unable to comprehend its *modus operandi*. Some have even disbelieved their own eye-sight, and denied *the possibility of raising water by the mere use of a pump-barrel with a valve at its lower extremity*. So strong has been the belief that there is some sort of legerdemain at the bottom of the affair, that Mr. Walker has been compelled to prepare a machine composed entirely of glass, to demonstrate that no deception is practised or intended.

Mr. Walker's apparatus steps in as if to settle the question which some years since was so rife between *friction* and *frictionless* pumps*—to show the perfect inutility of both "scrape and go" and "rolling pistons;" to put them both out of court, by demonstrating that, in reality, *no piston at all is required!* If the substitution of the rolling for the sliding piston effected, as has been stated, a saving of 73 per cent., dispensing with pistons of any kind may, of course, claim the saving of the remaining 27 per cent.

In my former communication I explained that Mr. Walker's apparatus depends for its action upon the momentum acquired by fluids when in motion, and that the patentee was about to construct some machines upon a large scale, to be worked by suitable mechanism; several of these have been completed to be worked by manual power, or by wind, and forwarded to climates where machinery for this purpose, constructed of less durable materials, has been found a subject of continual annoyance and expense.

The accompanying engraving (see front page) represents one of Mr. Walker's Elevators in its complete form. A is a winch-handle on a shaft, which carries a toothed driving-wheel B, working into a pinion C; upon the pinion-shaft there is an eccentric, from which a connecting-rod *d*, passes up to the overhead beam E. From each extremity of the beam E, two pump-rods *f f*, pass down to the two elevators, or water cylinders, *g g*, which may be of any convenient length, say from 30 to 40 feet, and from $1\frac{1}{2}$ to 3 inches in diameter; these

* By the bye, the expiration of Shalders's Patent three years since, does not seem to have tempted any other manufacturer to adopt his wonder-working contrivance.



cylinders are closed at their lower extremity H, by valves opening upward.

On turning the handle A, a rapid motion is given to the pinion-shaft and eccentric, which has an inch and a half throw; the connecting-rod *d*, being attached intermediately to the beam E, a throw of three inches is given to the elevators, which, thus receiving a rapid alternating motion, deliver a stream of water from their nosels I, into the cistern or receptacle, from which it flows in any required direction. The second engraving shows an arrangement for drawing water by means of this apparatus, from wells of a greater depth than could be advantageously accomplished by a single lift. E is the working beam to which two elevators are attached, the first, *gg*, raising water from the reservoir R, into R′, the former being supplied by the second elevator *g′g′*, from the well W.

The pinion-shaft is in some cases fitted with two, three, or more eccentrics, which give motion to a corresponding number of elevators contained within the same frame, so as greatly to increase the power of the engine, without adding much to its bulk. It will be apparent that as the one elevator, with its contained column of water, is exactly counterbalanced by the other, the machine is constantly in a state of perfect dynamic equilibrium, and therefore the motion communicated to the machinery, and thence to the fluid, produces a direct action, raising the largest quantity of water with the smallest possible expenditure of power.

What the capabilities of this engine may eventually prove to be, remains to be ascertained; in the machines already completed, the quantity of water raised far exceeded the performances of any description of pump hitherto employed; but as none of the machines were sufficiently large to employ the whole power of a man, mechanically considered, no data have yet been obtained upon which to found any calculations.

As the matter progresses, however, I shall have much pleasure in communicating the results, and remain, Sir,

Yours respectfully,

W. BADDELEY.

HYDRO-PNEUMATIC BUFFERS.

Sir,—In the February Part of the *Mechanics' Magazine*, which has just reached me, I find two articles having reference to my Hydro-pneumatic Buffers, described in the No. 956, for December last, the first signed "N. N. L.," the second, "E. Heydn," whom I presume to be the person who has been for some time shop-foreman in the carriage department of the Dublin and Kingston Railway Company's repairing establishment. I dislike, extremely, what is usually termed controversy, which seldom has truth for its object; and should not now ask a place in your pages for a few remarks upon these communications, did not the latter contain averments and insinuations of plagiarism on my part, which are as untrue as they are ungracefully put forward, and which I beg permission, in the first instance, to refute.

Some time in December, 1835, or January, 1836, a Mr. Dawson, a highly-intelligent coach-maker of this city, called upon me to enquire the cost of a cast-iron cylinder with open ends, bored true, about 4 feet long, and 4 or 5 inches diameter, which he stated he wanted for an experimental purpose. I had known Mr. Dawson as a railway carriage builder previously, and almost my immediate reply to him was, "that I could guess what the experiment was—that he intended it for an air-buffer;" and I then at once told him that I had previously given the subject some attention—that air-springs for various purposes of draft, &c., had been long ago proposed—that they never had been made to answer, in consequence of the impracticability of making a piston or stuffing-box air-tight—and that I considered the only road to success was, to confine the air by a liquid, such as water. I further, on the moment, sketched the general plan for the hydro-pneumatic buffer, such as it was afterwards executed.

Mr. Dawson had asked the cost merely of a bored cylinder: he *now* admitted it was for an air-buffer, and that his plan was simply a piston on the middle of a rod passing through stuffing-boxes in the otherwise close ends of the cylinder.

Having made proper drawings of my scheme, I showed them to Mr. Dawson, who agreed to make the experiment on my plan, I guaranteeing the cost not to exceed a certain sum. The apparatus was executed, and put to work by me, as already stated, without improvement or suggestion on the part of Mr. Dawson or any one else; and the actual cost was nearly double that guaranteed and paid by that gentleman.

I am, hence, not indebted to Mr. Dawson, Mr. Heydn, or any other individual, either for the distinguishing principle, or for any one of the details of this sort of buffer, which I am therefore justified in calling MY *hydro-pneumatic buffer;* and the full right and title of inventorship to which I thus formally reclaim.

What claim Mr. Heydn may sustain to having been the proposer of the plan meditated by Mr. Dawson I do not know; but I have no recollection of Mr. D.'s ever mentioning his name to me in connexion with it, (although I believe he was then employed by him in some capacity;) but granting Mr. H. the full credit of it—admitting that, in 1835, he "proposed to have a piston to compress air at atmospheric pressure in a cylinder, as a simple substitute for railway coach-buffers"—then he simply proposed to do what a score of others had tried to do, and failed, before he was born.

Air springs in this form were proposed in France in the time of Vaucanson; they were proposed and tried by Edgworth on wheel-carriages—were *patented*, as applied to draft and to harness, twenty years, or more, ago—were proposed to be used to ease the draft on the track-lines of canal boats by, I believe, Sir John Robison—are mentioned by Dr. Gregory—and had been talked of as applicable to buffing, by me, to various engineers, long prior to 1835, to whom I found the idea was by no means new, but who all concurred with me, that the impracticability of confining the air was a fatal objection. So much for the originality, even of the crude and imperfect notion; but now let us for a moment consider the "decided improvement," the plan of plans, which in the year 1842 Mr. H. brings forward to supersede mine. To avoid prolixity, the reader must refer to his figure, (page 139.) He proposes a cylinder having a solid packed piston, with a rod passing through a stuffing-box in the cylinder cover at either end, a valve opening inwards in the middle of the length, and a safety-valve outwards. Now, I omit all consideration of the pro-

portions of this affair, or of its details. I confine myself to a single point; and I affirm that, before a buffer of this sort were at work one week, both pistons would be found as near as they could get together, about the middle of the cylinder; and why? Neither the pistons nor the stuffing-boxes *can be made air-tight;* and hence, although the blow may be but momentary, (which is not admitted, however,) yet at *every* blow a small quantity of air would make its way out of the middle portion of the cylinder, pass the piston, and get between it and the cylinder cover, and there being nothing to remove this again, and its quantity being continually increased at every blow, the two pistons would soon get most lovingly together in the middle. But assume this not to be the case—assume, as Mr. H. does, that his pistons are absolutely air-tight—then, what is the use of his valve opening inwards? for, as no air can escape from the cylinder, but by passing the said air-tight pistons, and the cylinder is already full, no more can be drawn into it, after approach and on separation of the pistons, and so the valve is useless, unless as an adjunct to the preposterous safety-valve. We have therefore a very pretty specimen of reasoning in a circle. What the *learned* writer means by the "*rarefied* air in the centre," on "the *approximation* of the pistons," is hard to say, unless, being an Hibernian, he mean "*condensed*," when he says "rarefied:" this is the more probable, as he ingeniously says—his pistons, when relieved from a blow, "*collapse*"—that is, they *collapse away from one another!*

But enough of Mr. H.'s *invention*. Now, as to his observations on my buffer in use upon the Dublin and Kingston Railway, it might be enough for me to repeat, that I lost sight of it and the subject; and that, had I not thought the original construction needed improvement, I would not have designed those subsequently proposed by me. The first time I ever tried it along the line was with one carriage alone, after an engine, in which there was no one but Mr. Bergin, of the Dublin and Kingston Railway, and myself. On suddenly stopping and starting, the check was no doubt hard; but not more so than with Mr. Bergin's own buffers under similar circumstances, viz., the traction of a single empty carriage, violently started, and as violently stopped; but I on two or three occasions travelled in it as part of a train, and could perceive no difference in the buffing from the other carriages.

There is no doubt the friction of the cupped leather piston was too great, and hence, that the piston would commonly remain, perhaps, at three or four inches to one or the other side of the middle of the cylinder; but this is perfectly unimportant.

The air-vessels were under the seats, and *not* inconvenient: the weight of the whole apparatus, full, was only about 9½ cwt.; and hence, any objection on this score is preposterous, especially on a line where some of their first class carriages have six wheels, and six or more huge springs, and solid 2½-inch round iron buffer-rods; while this affair was in one of the worst and oldest of their light third-class carriages, which, if still in existence, must be a truly venerable article, but probably is so only in the sense in which a gun remains the same which has had a new lock, stock, and barrel; or in which it is said, the king never dies. It is quite likely the stuffing-boxes often leaked water for want of attention; but if they did, how much more would Mr. H.'s stuffing-boxes leak *air?*

I need not, however, pursue his remarks on this part of the subject farther: their ill-nature is as transparent as their irrelevancy to *the principle* in question, which is, the rendering an elastic fluid confinable as a spring by means of a liquid; and not whether the details of the method by which this was first attempted were perfect or not. I must add, however, that Mr. H.'s observation, that its being on the Kingston line, in the midst of a different system, was only so in *form*, and not in *system*, &c., is founding a sophism upon a wilful misconstruction of my words. True, it was, as I stated, a "thorough buffer," but different in structure and management from every other buffer on the line; and, I will add, capable of bearing shocks that none of them could stand.

The succeeding observations about my proposed upper, or top buffer, are scarcely worth criticism. Either I have been very obscure—or this writer is so obtuse, as to have wholly mistaken the very ground of my proposal. I am so fully

convinced, that a "coach body" will withstand no shock, that the very aim of my plan is to provide something in its place that will, and place *it* so as to receive the shock. The lever of the "first order," is very learned, though somewhat out of date as mechanics now stand; but, unfortunately, it should be, "a lever of the second order," as here talked of. Neither is there any mistake about the place of the centre of gravity of a *loaded* railway carriage, as, if necessary, I shall take occasion to prove, with permission, in your pages. Mr. H. leaves out, "loaded;" perhaps this seems to him unimportant! Mr. H. can state from much experience, "that in nine cases out of ten, whatever be the nature of a collision to a railway train, the coaches are never totally upset" Did Mr. H. ever see a collision, or the results of one, beyond the precincts of the Dublin and Kingston Railway? Never. How many collisions have there been upon it? *Two*, or *three* at most. This is the "much experience" from which he makes an induction of *nine cases out of ten;* and it may be questioned, did he ever witness *these* two or three collisions? I did not. Yet, I am credibly informed, that in one of them, some of the carriages were thrown right over the others, —and why? Because the buffers were below the centre of gravity, and there was no resistance to motion above that point. A capsizing, or throwing off the rails, has attended every known collision. Mr. H. does *not* know, but other people do, that what is called a "statical couple," cannot be equilibrated by any *one* force, or by any number of forces, applied at *one point*, or in a line at right angles to the arm of the couple. Yet, this is what is attempted to be done by the present arrangement of buffers of whatever system.

All that is said about the necessity of the top buffer on my plan being of equal size and strength with the lower ones, only shows the writer's imperfect comprehension of the subject, as must be evident to every competent judge, *i. e.*, to every mechanic who unites theory to practice.

I regret to have occupied your pages at such length, with matter comparatively uninstructive to read, and disagreeable to me to be obliged to write—and willingly turn to your correspondent "N. L.," whose gentlemanly style is in pleasant contrast with that of the paper just considered. There is a great deal of ingenuity in the plan proposed by this gentleman, for *buffing* the recoil of the buffer, by bringing it up against a second body of air; but it is a provision against an evil that does not exist in practice. No such thing actually occurs, (even in a large model,) as the plunger being driven out against the fillet of the cylinder with a sudden shock—or concussion—and for two reasons. In the first place, in the case of collision of two such buffers (say in train), the driven-in plunger cannot return outwards faster than the opposing buffer or plunger, permits it by resilience from it; but as both buffers are *imperfectly* elastic bodies, this velocity cannot be as great as that with which the plungers were driven. Further, the resilience of the buffer impinged upon, has a tendency to move uniformly, while the return stroke, or motion outwards of the impinging buffer, has a tendency to accelerated motion. Lastly, the friction of the stuffing-box gland is at all times enough to prevent any perceptible blow on the fillets, although unaided by the two former causes of retardation. The fillets, I should have stated, also have a collar of leather between them, against which they mutually abut.

But supposing that these were real conditions to be provided for, I much fear—indeed I feel authorized to affirm—that the method proposed would not meet the difficulty. First, because the centre diaphragm, or piston, could not be kept tight, being nearly inaccessible, and because the glands could not be even made tight from the practical difficulty of adjusting three perfectly coincident bearings on an absolutely rigid bar, such as the plunger is: the greatest practical difficulties also would attend the equation of the glands, and their necessary packing and fillets in connection with such a cylinder, the bore of which, and hence the diameter of the piston, being larger than that of the end glands inside the fillets.

All the moving parts requiring attention, &c., would be doubled in number, and more than doubled in liability to derangement, and it would be very difficult to attach the outer cylinder to the under carriage in a substantial manner,

and leave it free at both ends. These are all mere practical objections in detail, which, however, seem to me conclusive, as to the inapplicability of the contrivance, even if it were necessary, which it is not. The plan is, nevertheless, ingenious, and perfectly correct in principle.

Oil, in place of being a better fluid for these buffers than water, is about the worst possible; it is nearly as hard to confine as the air itself, and will break out of joints which are perfectly water-tight; nor has it any advantage in lubricating the parts: the packing of the glands is steeped in tallow and palm oil, which always preserve a greasy coat on the plunger, which the water, of course, does not remove.

Wherever the climate is such as to endanger the freezing of the water in the buffers, then *brine* is the proper fluid, *i. e.*, a saturated solution of common salt, which requires a very low temperature to freeze, and has no corrosive action on iron whatever, because it contains no combined air, as I have shown in another place. All oils get thick and viscous at moderately low temperatures, say 35° Fahr.

In conclusion, while I am conscious of having bestowed some care and thought upon the subject of these buffers, and therefore have not advanced crudities capable of immediate or obvious amelioration; still I am equally conscious that no new method was ever made perfect but by repeated trials, practice, and emendations. The principle I have submitted to the public, together with the best modes I at present know of carrying it out; and no one will be better pleased to see them improved, than, Sir, your obedient servant,

Robert Mallet.

ON THE MANAGEMENT OF FURNACES AND BOILERS. BY C. W. WILLIAMS, ESQ.

Sir,—In my last communication, I alluded to the absolute necessity for internal inspection before any correct estimate can be formed of the value or effect of any "smoke-burning" or smoke-preventive invention, or the extent to which combustion may take place in any furnace. Had the owners of boilers and furnaces been hitherto enabled to make their own observations—to see with their own eyes, and judge by the light of their own common sense—most of the absurdities of the present day would long since have passed into oblivion. Having however no other guide but the *dicta* of inventors, and seeing how utterly we are without the means of detecting the chemical or practical errors on which inventions are frequently based; the boldest assertor too often obtains the most encouragement, while he is himself, perhaps, deceived by occasional success, the result of causes over which he had no control, or of which, perhaps, he had no conception.

Under these circumstances, many plans which proceed on wholly erroneous principles, continue to be pressed on the unsuspecting public, while others, possessing real merit, are rejected, from the want of suitable means for estimating their qualifications. In the absence of internal inspection and observation, no plan should be sanctioned as efficient, or rejected as unsound; seeing how the supposed merit of the one may be dependent on unascertained, unsuspected, or partial causes, while the supposed defect of the other, may be the result of accident, omission, or local circumstances — all of which, however, would have been instantly detected had suitable means of inspection been afforded. Of these, I will hereafter give some illustrations.

At present, we have no test of the working of any "smoke-burning" expedient, but the appearance or disappearance of the black cloud at the top of the chimney; yet this absence of visible smoke, may really be the result of injudicions and even wasteful expedients, or the passing off of the combustible matter in an invisible, rather than a visible form. For as to drawing any correct inferences from occasional results, while we are yet unable to ascertain or determine the causes which produce them, it is but a species of self-deception, in which we would most likely be setting down to principle, what, if we had the means of judging correctly, would be found attributable to merely local or accidental causes. Thus, we are often unconsciously the means of perpetuating error and fallacy; and hence, also, the discrepancy between the results attributed, by different experimenters, to one and the same plan or process.

Had we the means of observing what is really taking place in the interior of furnaces and flues—of ascertaining what kinds of gas are generated during the successive stages of the process—to what extent they enter into combustion: whether visible or invisible smoke be generated—to what extent, at what times, and from what causes: were we enabled to observe the effect of admitting or excluding air—and above all, of ascertaining the varying degrees of heat produced during these several stages and processes, we would then be in a position to appreciate merit or detect fallacy; and thus decide between truth and error. Now the obtaining correct information on all these points is strictly within our reach.

Again, as to the evaporative power of any particular kind of fuel; with such means of inspection, positive results would be obtained, whereas we are at present dependent on the care, judgment, or prejudices—too often the neglect or evil intentions—of a mere fireman, since much of the result of any trial is absolutely under his control, (as will be shown hereafter,) in the absence of the means of that personal inspection and observation, which would have enabled the proprietor to detect the causes of apparent success on the one hand, or apparent failure on the other. Under the conviction of the value and even necessity of being enabled to form a correct opinion in such cases, I propose showing how the proprietors of works may, with a *minimum* of trouble and care, be qualified to judge for themselves, and correct the misstatements of interested parties, who would palm upon them some ingenious, but insufficient scheme.

I will now describe the various changes and effects produced in a furnace and its flues from the throwing on of a fresh charge of coal until it is exhausted, and another charge be required; of the correctness of which all can form an opinion.

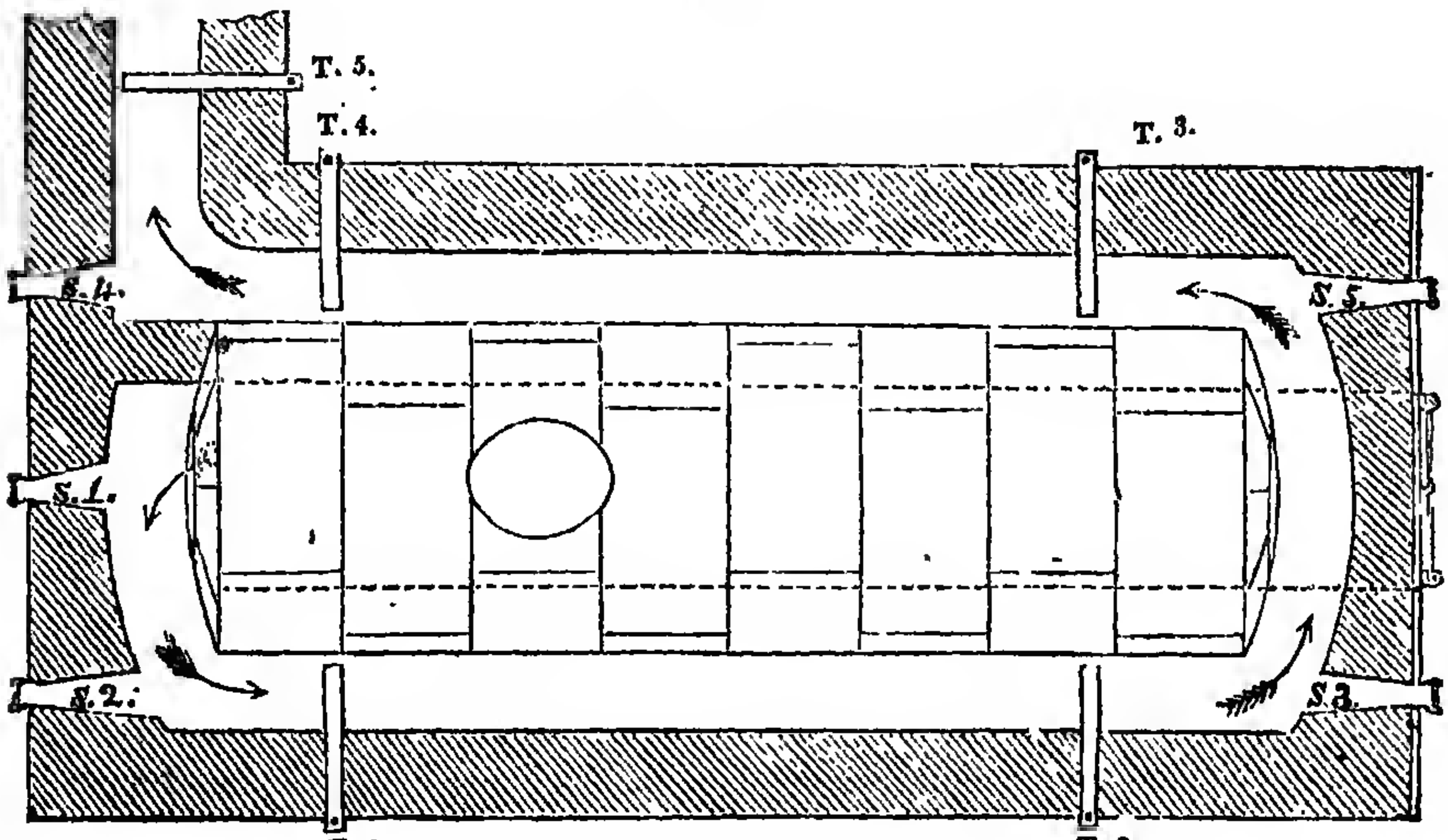
Let the annexed engraving represent a cylindrical boiler 15 feet long, (the length of that from which I have drawn the following facts,) set over a furnace furnished with the means of admitting air in the proper manner, or of shutting it off at will, for the purpose of noting the varying results. To enable the operator to observe all that is going on in the interior, five glazed spy-holes, or windows, are provided, as shown at S 1, 2, 3, 4, and 5. By means of the centre one, S 1, placed exactly opposite to, and in the line of the furnace, a distinct view is obtained of what takes place behind the bridge, and even in the furnace itself. This is the most important spot for observation. By S 2 and 3 a view is obtained quite through the left-hand flue; and by S 4 and 5 through that at the right hand. The being thus enabled to see, not only *into*, but *through* the flues, is of the greatest importance, as will be shown hereafter.

By these means we are qualified to judge of all matters depending on sight; as, for instance, the length, quantity, and colour of the flame—the alternations in the production of flame or smoke—the particular time and circumstances under which such changes take place, and so on; and when we consider how accurate a test is *colour*—indeed, how often it is the only test, as to the nature of the gas in combustion, and hence the quantity of air required or of heat produced—the value of this *visible* test will be duly appreciated. Indeed, without the means of knowing what colour the flame assumes, the chemist will inform us it is frequently impossible to decide what species of gas is coming over—at what rate, and in what proportions, they succeed each other—and to what extent they are inflamed. Now this succession of consecutive changes, and their relative effects, forms one of the most instructive and influential objects of inquiry in estimating the operations of the furnace.

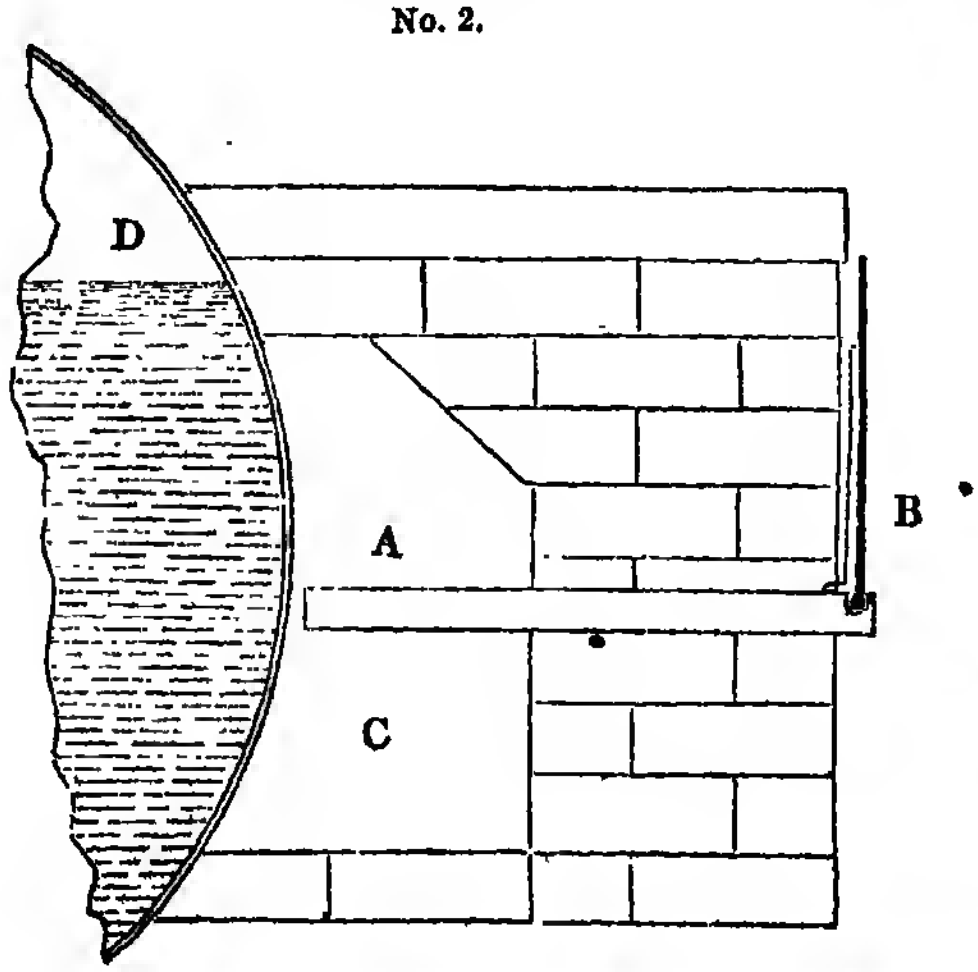
So far as ocular demonstration is required, we have thus ample means of detecting errors and drawing correct inferences. As, however, it is absolutely necessary that we should be enabled not only to *see*, but *feel*, additional means of information must be supplied. For instance, it is essential we should know what influence the several changes and processes going on in the furnace may exercise as to temperature, and all that belongs to heating and cooling. On these points, the required information may be obtained, approximatively, if not absolutely, by means of thermometers, ranged in the most suitable places, as shown in the annexed engraving, at T 1, 2, 3, 4, and 5. These thermometers are attached to copper bars, as will hereafter be described; the bars being thrust into the flues at

the places pointed out. Bars 1 and 2 indicate the temperature in the left-hand flue; and 3 and 4, that in the right-hand flue. Thermometer bar No. 5, (unquestionably the most important,) is situated at the end of the flue where it enters the chimney shaft, where it will indicate the amount of waste heat, inasmuch as the heat which this part of the flue contains, beyond what is required for maintaining the necessary draught, is as much an absolute loss, as if the fuel from which such heat was produced had been wasted, without passing through the furnace. For where is the difference between wasting the fuel, in the first instance, or wasting the heat which such fuel produces? This thermometer, then, may be taken as the index of the quantity of heat wasted, and, therefore, of an insufficiency somewhere, by which such waste has been incurred.

No. 1.



No. 2.



A. Conductor-bar
B. Thermometer.
C. Flue.
D. Water in boiler.

Now, supposing the furnace to be in full action, with a fresh charge thrown on the body of ignited fuel on the bars, and when in the proper state (of which more must be said hereafter) the first effect, as to temperature, will be a cool-

ing one. This is caused by the evaporation of the water or moisture, which is more or less contained in all coal. The presence of this moisture, with its cooling effect, is not, however, to be considered as an evil unaccompanied by a commensurate good. This will be explained as we proceed. After exhibiting a diminished temperature for some minutes, the thermometers begin to rise, as the coal gas (carburetted hydrogen) then evolving from the coal enters into combustion. The colour of the flame, and the distance to which it will extend, will now begin to indicate the nature and quantity of gas generated, and the degree of perfection in which the process of combustion will be effected; while this latter, in its turn, will be dependent on the degree and rate of diffusion which takes place between the atoms of the gas and those of the air; the whole, in fact, depending not so much on the quantity of air introduced, as on *the mode* of its introduction; and this is the point which practical "smoke burners" overlook, but which is beside our present question. I am here, however, presuming that the introduction and diffusion of the air with the gas, is managed in the most efficient manner behind the bridge.

Accordingly, as the air is introduced, properly or improperly, we find the colour of the flame will now become an index of the temperature in the flues; and, in this respect, we shall have under command all the changes and appearances which the Argand gas-burner or oil lamp exhibits; from the extreme of a dark, murky red, with a reduced temperature, up to a clear, brilliant white, with an intense heat; these varied effects being produced by the action of the air-valve, in the same manner, and with equal rapidity, as in the lamp, when we check the admission of air by the centre orifice. If, however, due means be not provided by which these changes of colour and intensity can be seen and compared, how can we venture, while thus literally in the dark, to pronounce on the causes of such changes? As well might we suppose that the Argand burner or lamp could have been perfected, if the experimenters had been prevented seeing and comparing the effects produced, and tracing each to its proper cause. On this head we may also be assured, that as colour is closely allied to intensity, in the nature of flame, much of what is said on this subject is equally applicable to the combustion of coal gas in the furnace as in the lamp. As the combustion proceeds, the length of the flame will be in the proportion to the quantity of gas generated. This, however, is much more equable than might be supposed; and, to a great extent, is governed by the mode of feeding and the dimensions of the flues.

An important question here arises, respecting the quantity of air admitted at the beginning, middle, and end of the process, from the throwing on a fresh charge, to the time when another will be required. Much has been said on this subject, and many objections raised against the absence of a regulating valve, by which the quantity of air admitted may be in proportion to the quantity of gas evolved. This branch of the subject is a highly important one, and can only be determined when we have some more correct data before us; I will not, therefore, enter on it at present, the question being, in fact, one of expediency, and a balance between the evils of a manual or mechanical adjustment on the one hand, and the inconveniences of the supply being occasionally *plus* or *minus* the exact quantity required. Objections, however, against the giving something like system to the admission of air, because it may not be complete, and in perfect harmony with the supposed supply and demand, come with a bad grace from those who have not only overlooked the total absence of all regulation and control as to the admission of air in ordinary furnaces, but advocate—what is still more opposed to chemistry and nature—the compelling the supply of air, both to the gaseous and solid portions of the fuel, to enter by one and the same channel, namely, the ash-pit and bars; by which any adjustment of the required equivalents is rendered absolutely impracticable. And if a regulating principle be necessary, when both the mechanical and chemical impediments, arising out of a single orifice of admission, are removed, *à fortiori*, it will be more so when the whole supply is confined to the ash-pit alone, with its ever-varying obstructions and facilities, arising out of the states of the furnace, and the fluctuating quantity of fuel on it. Indeed, this new-born zeal for a controlling and regulating influence, seems strange in the

mouths of those who advocate the prevailing system, the prominent and admitted feature of which is, that exactly when the largest quantity of gas is evolved from a fresh charge of coal, the smallest quantity of air is enabled to enter through the bars, by reason of the obstruction which such charge creates.

On this ground, then, I might be excused for throwing the *onus* on them of providing the suitable means of adjustment. When, however, I come to treat of the two supplies of air, I shall be able to show, practically, how they aid each other, in going far towards accomplishing all that perhaps may be desirable. But to return.

As the operations of our furnace proceed, the temperatures indicated by the several thermometers will be in the ratio of the heat conveyed by the currents of gaseous products in the flues, at their several stations, and the quantities abstracted and absorbed by the boiler-plate surface, within their respective divisions. Much new and valuable information will be obtained by observing these proportions, and the periods of their relative changes.

If, from the construction of the flues, or other circumstances, which we cannot now stop to examine, the surfaces be not equal to the absorption of the heat generated in the furnace, the excess, (which is an absolute and *pro tanto* loss,) will be indicated by the thermometer No. 5. And here we have a new and important field for observation, and one which has hitherto been too much neglected. In fact, the variations of internal temperature which the thermometers exhibit under different modes of firing, different kinds of fuel, different modes of managing the same fuel, different states of the atmosphere, and, above all, different modes of admitting or excluding the air, show at once how little reliance can be placed on any calculation of results, unless the quantity of heat thus passing away, and irretrievably lost, be taken into the account; this amount of waste or surplus heat being, in fact, an important element in the inquiry.

In the elaborate report of Dr. Schafaeutl, on Player's boiler, we see how much he felt embarrassed by this question, and the difficulty of estimating its amount and calorific value, ranging as it did from 230° to 600°, and of course not knowing how much it exceeded that point, from the want of a correct pyrometer. In many of the reports on boilers by Mr. Parkes, we find him embarrassed by the same difficulty—conscious of the heating power he was losing, yet unable to bring it to account. In the experiments by Dr. Fyfe on the evaporative power of coal, the temperature of the escaping gases, or the quantity which passed away in the form of smoke, were wholly neglected. Yet we find him making his calculations exclusively on the other elements of the inquiry, and on these manifestly insufficient data estimating the supposed relative values of anthracite and bituminous coal! Such, indeed, was the difficulty of estimating the heating value of the gaseous products escaping by the chimney, that the learned Doctor thought it safest to throw them fairly overboard, and confine his comparative results to the mere quantity of "fixed carbon, or coke," which each contained. Yet we find, by Mr. Faber's results, that one of those gases alone, the carbonic oxide, (a gas which in ordinary furnaces, to a great extent, passes away unconsumed and invisible,) under proper management, and by a judicious introduction of air, in the very way I have suggested, *by small jets*, was equal to the production of an intensity of heat sufficient for the manufacture of iron.

Of the true calorific value of the escaping heat, under its various modifications, it is difficult to form an estimate, in the absence of a pyrometer of easy application; but a still greater difficulty presents itself as to the mode of turning this waste heat to the purposes of evaporation, when found to be in excess. On this head I hope to be able to suggest a practical remedy, and to this point I am directing particular attention.

It is curious and instructive to note how the eye, where proper means of observation are afforded, sets us right, by explaining and correcting many of the otherwise anomalous changes of temperature which the thermometers, in their respective situations, indicate, and *vice versa*. The thermometers, under certain circumstances, rising when, according to our received notions, they should have fallen, prove that some indicator of this kind was wanting; while the eye, that

infallible corrector of theoretic fallacies, proves how erroneous have been our notions, in many points connected with the source, and existence, and character, of visible flame. During the entire process I have been describing, from the beginning to the end of the change, we perceive no indications of any sudden action or effect: all proceeds with a regular ascending and descending progression, the whole being a succession of well-defined changes, completely under control, and exhibiting a beautiful and instructive series of causes and effects. Without those aids, however, which the eye and the thermometer afford, much would have been unintelligible, often apparently capricious, and even contradictory of what might have been predicated under the circumstances. It is by such means we are enabled to penetrate, as it were, the secret operations of nature, and correct our own erroneous notions and calculations. It is thus we may be said to be experimenting on the great scale, with all the accuracy and certainty of laboratory practice. By means of the eye, the chemist is enabled to detect the presence of what otherwise he could not have expected; and by that of the thermometers, to trace effects to causes, which, without such aid, would have been impossible.

In my next I will pursue the subject farther, and describe the several gases in the order in which they are developed, and enter into combustion, with the visible and thermometric changes which follow, and the relation they bear to each other.

I here take the opportunity of observing, that as my only object is to improve our practice by commemorating the facts which have come under my own observation, and showing their connexion with scientific details, and chemical analysis, according to the best authorities, I am quite indifferent to the charges with which I have been assailed, of broaching new theories, or new views of combustion. I have no such pretension, and aim at nothing but practical improvement, and not in the character of an amateur, but strictly within the province of my duties, and in furtherance of the interests of the company in which I am interested. I have sufficiently, in the Preface to my Treatise on Combustion, shown how in self-defence I had been driven to the necessity of examining for myself, and endeavouring to find a way out of that dangerous uncertainty, in which all steam-consumers, steam-shipping companies in particular, are involved, in all that concerns the expenditure of fuel, and the construction of furnaces and boilers. Repetition, therefore, would here be misplaced, although the facts are interesting in a public point of view, as the subject is one of deep interest to the community.

One of my objects in bringing the practical details of the subject thus before the public, through the appropriate columns of the *Mechanics' Magazine*, was in the hope of meeting useful comment, and exciting others to labour in the same field of practical improvement. I find it therefore inconvenient and unsatisfactory to discuss detached portions of the subject with casual objectors, the more so, as objections are too often raised, not with the view of searching after truth, and aiding in the inquiry, by throwing additional light on the subject, but merely for the sake of opposition. Where also such controversy is carried on, manifestly under personal, rather than scientific notions, it can lead to nothing useful, and therefore I beg to decline it; reasserting that as the subject is one of great interest, I shall at all times be glad to be set right where I may state chemical facts erroneously, or draw inaccurate inferences,

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, March 14, 1841.

ON THE CAUSES OF FIRE—DANGER OF DISCARDED CONGREVE-MATCHES, OPEN CANDLES, ETC.

Sir,—Too much stress cannot be laid upon the remark of Mr. Booth, quoted in my last, (page 175,) "that by attention to the published causes of fire, great good will be accomplished;" and I would wish to make a few observations on the immense danger to which he has adverted, of a careless or thoughtless use of congreve matches, now in such universal employment for the production of light. Many persons know by painful experience the consequences of kindling one of these matches immediately over, or in close contiguity to a quantity; beyond the per-

sonal suffering thus occasioned, further mischief seldom results, because the fire is directly extinguished by the party occasioning it. The great danger lies in the discarding of such matches as from having become damp, or from some other cause do not ignite. To explain what I mean, I will suppose the following case:—A number of workmen enter a carpenter's shop on a raw damp morning in November; one of the party, or a lad, proceeds forthwith to light a fire in a proper stove or in a temporary structure of bricks, to afford warmth to the workmen and to heat the glue-pot. The congreve matches are resorted to, but the moisture of the atmosphere has been attracted to the composition; the first two or three matches "miss fire," and are thrown down in front of the grate, at length a light is obtained and the fire kindled. Breakfast time arrives, and one of the workmen, before quitting the shop, goes to see that the fire is all right, or to put on fuel, or it may be to take off the glue-pot; on leaving the fire he treads on one of the discarded matches, which, by this time, has become dry from the proximity of the fire, and inflames unperceived. The fire thus kindled finds abundance of food in its vicinity in the shape of dry sawdust, shavings, &c., and in less than a quarter of an hour after the workmen have left the shop, it is enveloped in flames,* and the origin of the fire is for ever shrouded in mystery.

Or we will suppose that the matches lay drying and unmolested till the evening of that or the following day. After all the workmen have left, the master himself, or a sober careful foreman goes over the shops, and having seen all safe, he approaches the fire-place to see particularly that no lighted embers remain to originate a conflagration. Finding "all right," he leaves, but on leaving, steps on the fatal match, and germinates the very mischief he is so sedulously guarding against. He has scarcely entered his own adjoining dwelling, than the cry of "fire" meets his ear, and running out he finds how little his care has availed, the premises being *mysteriously* inflamed from one end to the other! Little does he suspect that he himself is the incendiary!

* Messrs. Winstanley's shops were burned down about two years since under somewhat similar circumstances.

I have put this as a suppositive case, but I have good reasons for believing that it has been, in more than one case, a reality.

I cannot help thinking that the "singular case of burning," narrated at page 176, originated from a similar cause. A smoker, perhaps, in lighting his much-loved weed, had dropped or discarded a congreve match, which lay on the pavement, in the sun's broad glare, until highly dried and heated; the poor little sufferer trod, with her half sliding step, on the dangerous composition, which inflamed with violence, and set fire to that portion of her apparel which was in close contact with it, and caused her melancholy end.

While speaking on the causes of fire, I cannot help adverting to the increasing number of accidents arising from the careless use of candles. Housekeepers would do well entirely to discard the use of open candles, when carried about, or when taken into bed-chambers and the like; if the expense of a neat glass lantern is too much, very safe wire-gauze lanterns are to be had at a very trifling cost, by which the ignition of bed or window curtains, and of apparel, may be prevented.

A most dangerous practice prevails amongst females, both young and old, but especially the former, of *placing lighted candles on the floor*, while kindling fires. Could the amount of personal suffering and the number of deaths produced by this practice be set forth, I think no master of a house or father of a family would allow such a course to be persisted in. The wearing apparel of the offender happening to come in contact with the candle, she is soon enveloped in flames, and such accidents as these generally happening before any other member of the family has risen, she perishes before any assistance can be rendered.

By the use of fire and candle guards, the published number of metropolitan fires, last year, might have been reduced in number nearly ONE-THIRD! While there is every reason to believe that the number of unpublished accidents of this kind, which might have been by such means averted, greatly exceeds the whole number of published fires, upwards of one hundred of them being attended with fatal consequences.

Under such circumstances, it is im-

possible to overrate the importance of attention to this subject.

I am, Sir, yours respectfully,

WM. BADDELEY.

29, Alfred-street, Islington, March 7, 1842.

MESSRS. PALMER AND PERKINS'S PATENT PUMP.

Sir,—In your Magazine, No. 967, there is a communication from Mr. Trebor Valentine commenting upon the explanation of Messrs. Palmer and Perkins's Patent Pump, contained in your No. 963. Patentees are always much obliged by the notice of their inventions by scientific gentlemen, and presuming that the remarks of Mr. Valentine proceed from a kindly, and not a controversial spirit, I have no difficulty in replying to him.

Mr. Valentine evidently bases his remarks more upon the drawing than the explanation of this invention, expressing his first doubt to arise from the drawing representing so short a *suction pipe*. Now it is perfectly understood, that drawings, intended to illustrate descriptions, are made more for that purpose than to provoke criticism. If the action of the pump in question is good, and it produces the requisite vacuum, the suction will follow as a matter of course, *notwithstanding the shortness of the pipe in the drawings;* and it was the object of the explanation to show that the action was such.

Mr. Valentine goes on to say, that the experiments already made do not justify the hopes entertained by the patentees of the utility of their invention for mining purposes. Perhaps not; but still, the description explains that two men worked a 10″ pump, raising a column of water 15′ 4″ high. It is therefore an allowable inference, (while it was a conviction with the patentees,) that a greater motive power would have lifted a higher column. Probably Mr. Valentine may himself have been a patentee, and if so, he will have a fellow-feeling for the heavy preliminary expenses attendant on new inventions, and know how unavoidably they form a limit to the actual experiments which would justify every "*foregone conclusion.*" But, as touching both these points, I will, if he wishes it, introduce him to an establishment in London where there is a 7″ pump on this principle, which draws the water from a well 365 feet distant, the level of the water in the well being 17 feet below the clack valve; which height, added to 23 feet of rising main, makes a total vertical lift of 40 feet. This pump has been going night and day, making 25 strokes, and the piston travelling 32 feet per minute, ever since the 4th of February last, without requiring any attention: certainly this fact supports the pretensions of the patentees, that their pump will prove a valuable resource for mining purposes.

As to the other point, on which Mr. Valentine appears to entertain suspicion, viz., the reduction of friction, I can only say, the experiments were fairly and anxiously conducted with a view of arriving at the truth: the 10″ pumps, with which the experiments were conducted, are still standing at Mr. Charles Robinson's, accessible to all the world, and are, in fact, the best reference as to their separate or comparative merits.

I remain, Sir, your obedient servant,

EDWARD W. PERKINS.

67, Mark-lane, February 28, 1842.

AMERICAN MARINE STEAM-ENGINE MAKING—THE KAMSCHATKA STEAM FRIGATE.

Sir,—In Number 956 of your Journal, I notice a description of the *Kamschatka* steamer, together with observations reflecting rather severely upon "Brother Jonathan's" attainments in marine engineering. The correctness of your conclusions in regard to the plan of the engines and boilers of that ship, cannot be questioned. That the fault does not rest with American *engineers*, it is my purpose to show, and I trust these few remarks will find a place in your columns.

I would beg leave, however, first to correct your statements in reference to the material used in the hull of the *Kamschatka*. The *frame* is of *white oak* throughout. The *plank* and *ceilings* are entirely of *white oak*, (not "Canada elm," the use of which is here unknown) fastened with * bolts, composition spikes and locust treenails. *Walls* of *white oak* 5 inches thick, and not "scored on the frame." The frame is further secured inside by diagonal braces of iron, 5 inches wide, 1 inch thick. So far at least as the construction of the hull is concerned, I trust you will allow the builders credit for good workmanship.

The history of the building of the

* The writer has left a blank here for the material of which the bolts are composed.—ED. M. M.

Kamschatka is a curious one, and forcibly illustrates the influence of *words* when brought into competition with the ordinary manifestations of practical good sense. The story runs thus: The Russian government sent to this country two officers of their navy, with the power to contract, through the agency of an American citizen, for the building of a steamer of war, and also to superintend its designing and fitting out. These individuals, upon their arrival here, became associated with a gentleman of the legal profession, who, it appears, was somehow interested with the patentee of the half-beam engine, as it is termed, and who became at once their nominal engineer (!) and contractor. The ship was designed and modelled under the direction of the Russian officers; and the quantity and quality of the timber used, likewise submitted to their control.

The designing of the machinery was left with the contractor, who brought to his aid such engineering talent as could be obtained in the by-ways of the profession; its construction, from detailed drawings, was given to various establishments in this city.

Now, I would ask, what have American engineers to do with this? So far are they from approving the arrangement of the *Kamschatka's* machinery, that I venture to assert, that there is not one engineer of intelligence to be found in this country, who will approve any one of its features, or who would not blush to own it as an American production, despite the fulsome adulations of the press.

As to the progress of steam navigation in this country, I do not mean to speak, except in its defence. The same eagerness to improve the marine engine, by modifying its shape, at length evinced by the English and Scotch engineers, is manifested still more in the efforts of American engineers. On our part, experiments have been conducted mainly with a view to conform to that system, which has obtained, in our river navigation, viz., engines with cylinders small in diameter, and a corresponding decrease in weight of the working parts; in order to do which, various expedients have been resorted to, but as yet, with no very satisfactory results. The inference seems to be gaining strength, that the present form of the English marine engine is the best shape in which steam power can be applied to the purpose of navigation; and when we shall succeed in adapting it to our favourite system of long stroke, with the means for obtaining the sudden admission and exhaustion of the steam, it will be generally adopted, so long at least as the common paddle-wheel is employed as the propelling agent.

F. W. S.

New York, February, 1842.

ARTIFICIAL FUEL A MODERN ANTIQUE.

Sir,—The public attention has been recently much drawn to the subject of artificial fuel, and in a historical memoir which I read last month of the various methods which have been patented for the purpose, the earliest is stated to have been one invented by a Mr. Peter Davey, May 20, 1800. Such of the readers of your valuable Magazine as may be curious respecting the history of this manufacture, may be gratified by being referred to a much earlier mention of it to be found in Hugh Platt's *Jewel House of Art and Nature*, first printed in the year 1594, a copy of which is preserved in Chetham's Library, in the college, Manchester. In this work it is recorded, that a Mr. Gosling, a merchant of London, was at the expense of printing handbills describing how a species of artificial fuel might be manufactured, and distributing them to the poor of every parish in London and its vicinity. The following is copied from his handbill. "Get," says Mr. Gosling, "a load of stiff loam or clay, and take half a peck of it, and with a shovel make it soft with water, then put a peck of small coal to it, and incorporate or mix them all together, until you may roll it or mould it into several parts, like pieces of charcoal or long eggs. As many may be made in a day as will last a quarter of a year. Any other combustible may be mixed up with it, such as peat turf, saw dust, curriers' or shoemakers' threads, tanners' waste bark, and such like." The worthy Mr Godfrey adds, in a note, that he dispersed freely many thousand of these handbills, "for the *good of all people in the land.*" He left it for the present generation to *secure* the same thing by patent.

I am, Sir, yours respectfully,

JOSEPH HENRY REDDELL.

Phœnix Chemical Works, Bow Common,
March 2, 1842.

MR. DAVIES'S ELLIPTOGRAPH.

Sir,—I am much pleased with Mr. Davies's ingenious instrument mentioned in No. 963, p. 73; but while contemplating it, I felt doubtful whether it would draw an ellipsis; and upon finding points in the curve which an instrument made and set *exactly* as represented at page 73 would draw, I found the curve too flat near the major axis, and I suspected it would be too much curved about the minor. I must explain that I supposed the upright stem to remain in every respect immovable, and the compass head to move *vertically*, as well as circularly upon it; and also, the guide *i* to have a knife edge, which I think will be found necessary, because its positions will coincide with radial lines from the centre of the stem *a*, and not with the radii of curvature of an ellipsis, such as *g* would appear if viewed in the direction of the stem.

I then submitted the matter to a mathematical friend, who, after investigation, declares that the instrument will only draw an ellipsis when the major axis of that ellipsis is in a certain fixed proportion to the diameter of the plate *g*, the proportion depending on the lengths, &c. of the other parts of the instrument. If this be correct, as I have no doubt it is, most likely some of your correspondents will furnish you with the investigation and proof; but I beg to say, I do not hold myself responsible for its correctness.

I mention these facts, because I think they indicate a peculiarity in the instrument which should be made known, and which has probably been overlooked, as it is described at page 74, as being perfect; they may be also useful in directing the construction. But, as it is possible Mr. Davies may fancy these remarks will injure the reputation of his instrument, which I have not the least doubt may be made more than sufficiently correct for its intended purpose, I shall feel obliged by your showing him this letter, that he may have an opportunity of publishing any observations he may wish to make upon it in the same Number in which it appears.

Your obedient servant,

S. Y. (An Engineer.)

February 3, 1842.

[In compliance with S. Y.'s request, we forwarded a copy of his letter to Mr. Davies, who wrote to us that a present pressure of occupations would prevent him from sending his remarks upon it in time for contemporaneous publication. He feels, however, "not the less obliged to S. Y. for the courtesy of his communication."—Ed. M. M.]

STEAM-ENGINE IMPROVEMENTS — PILBROW'S CONDENSING CYLINDER ENGINE PRACTICALLY CONSIDERED — CORNISH AND MARINE STEAM-ENGINES.

Sir,—The difficulties that surround an inventor's path are sufficient to appal and damp the spirits of all but the most *confident and resolute*: yet these necessary qualities are apt to produce extreme views of the circumstances in their favour, unless regulated by a desire of the truth, such as has been evinced in Mr. Pilbrow's reduction to a more reasonable amount, of his estimate of the possible advantages due to the principle of his suggested plan for a steam-engine. Amongst these difficulties, that of obtaining a correct standard of comparison is not the least. Unfortunately for patentees, it is seldom sought for with diligence; yet its obvious necessity sufficiently justifies the course that has been adopted by Mr. Pilbrow, in mooting the question of the superiority of the engines made by Watt over those of recent construction. I certainly deemed the evidence inconclusive, and the conclusions inadmissible; but I never intended to impugn, in any way whatever, the accuracy of the experiments reported by Farey, from short trials under favourable circumstances. I communicated my views of the trials under such conditions, in compliance with Mr. Pilbrow's request; but I avoided the practical part of the question, whether this engine would effect the object proposed. Nor should I now again trespass on your pages, but for the expression of regret on his part that I had done so.

I will, however, first advert to a misapprehension, by Mr. Pilbrow, of my meaning. I did not, as he supposes, refer to the difference of temperature of the condensing cylinder and the condenser of a marine engine, but to the difference of temperature between the steam cylinder and condensing cylinder of Mr. Pilbrow's engine. I do not urge my estimate of

$\frac{3}{4}$ lbs. as correct, but I am convinced some difference of pressure will exist, due to the contraction of the valves and steam passages, jointly with the difference of temperature. The use of cold water round the condenser, however difficult its practical application may be, will favour my views. In referring to Farey's tables, I find the pressure due to 96° is about $\frac{8}{10}$ lbs.; a much closer approximation, I must admit, to $\frac{3}{4}$ lbs. than the 1 lb. I assumed from imperfect recollection.

The beam for working Mr. P.'s condensing cylinder is only about $1\frac{1}{4}$ of the length of the stroke, and its ends work in an arc of about 115°; while the amount of deviation from the straight line is placed on the inside only. The framing and joints appear adapted for an engine intended to exert a less, rather than a greater power from a cylinder of a given size on the crank; and, further, the valves and steam passages between the cylinders are extremely contracted.

These observations apply in no respect to the principle of the engine, but to arrangements that may be readily altered, though perhaps not without some increase of weight and space occupied. The comparison with the beam marine engine is at present perfectly fair: how long the latter will remain the standard is another question; and on these important points of weight and space the *Devastation's* engines, by Maudslays and Field, and the *Virago's*, by Boulton and Watt, will be awkward rivals. An inventor has to contend not only with the best engines of recent construction, but with all the improvements that may be effected in them; arising, perhaps, in some cases, from the very competition which his patent has excited.

I congratulate Mr. Pilbrow on the accession of a warm friend to his cause in "Scalpel," and on the latter's estimate of the value of the invention. The novelty and ingenuity of it I have always been ready to acknowledge, though perhaps the doubts I have expressed respecting the extent to which it is available, (a point on which all now seem to agree,) may not be considered such an indirect compliment as to bear that interpretation.

I shall be glad if my good wishes could give him a fair field and no favour, with plenty of time, and means to use it; and I trust the objection I have made to the arrangements shown in the drawing will be taken in good part, as not intended to injure the patent, but to call attention to the best means of insuring success.

So much has been said respecting Cornish engines, and their expansive action, &c., that I deem a comparative statement of the steam and water conditions used in them and their rivals in size and their superiors in power, the larger marine engines, if not of utility, may perhaps be of interest to some of your readers, many of whom are perhaps not accustomed to see the results of expansive action exhibited in the following form.

Comparative Statement of the Performances of Cornish and Marine Steam-engines.

	Cylinder in inches diameter.	Stroke in feet.	Cubic feet in cylinder.	Steam cut off at	Cubic ft of steam including clearance.	Stroke per minute.	Steam in cubic feet per minute.	Steam admitted into cylinder in lbs.	Mean steam in lbs. per square inch.	Volume from 1 of water.	Water in cubic feet per minute.
Gt. Western	$72\frac{1}{2}$	7	200	$\frac{2}{3}$	140	60	8400	16	15	1700	5·
Corn. Engine	80	10	350	$\frac{1}{6}$	60	6	360	35	$16\frac{1}{2}$	730	·5

	Area of cylinder in square inches.	Feet of motion per minute.	Mean steam pressure in lbs.	Steam in lbs. one foot high.	Steam in horse power.
Great Western......	4128	× 420	× 15	= 26,320,500	800
Cornish Engine ...	5026	× 60	× 16·5	= 4,975,740	150

Now, taking the ton of coals at 24 bushels, 26 tons = 664 bushels, and

$$\overset{\text{men}}{5} \times \overset{\text{bush. per day}}{1440} = \frac{7200}{864} = 10\tfrac{1}{2} \text{ cubic feet of}$$

water per bushel;

$$\overset{\text{men}}{\cdot 5} \times \overset{\text{bush. per day}}{1440} = \frac{720}{10\tfrac{1}{2}}$$

= $68\tfrac{1}{2}$ bushels, or less than 3 tons of coals per day. The work done by the boilers of the *Great Western*, in the evaporation of water, is just 10 to 1; but the effect of the steam on the piston is only as $5\tfrac{1}{2}$ to 1. The quantity of water consumed at each stroke of the cylinder is not quite exactly the same in both engines, as ·5 has been substituted for ·498 of a cubic foot per minute, in the Cornish engine.

$$\begin{array}{lll} 5 \div 60 & \cdot 0833 & \\ \cdot 5 \div 6 & \cdot 0833 & \times \overset{\text{lbs.}}{62 \cdot 5} = 7 \text{ lbs. of water per stroke.} \end{array}$$

The conditions were approximately taken from practice, without reference to this point, and the circumstance was not noticed at first.

The value of the cylinder vacuum, and also the value of the friction air-pump power absorbed, must be estimated, to obtain the net horse power, according to each person's views; and it is as easily managed with the total steam pressure expressed as horse power, as with the pressure in lbs. per square inch. Taking the condenser at $\tfrac{3}{4}$ lbs., and the mean difference between it and the cylinder at $1\tfrac{3}{4}$ lbs. we shall have $2\tfrac{1}{2}$ lbs. resistance on the under side of the pistons of the *Great Western's* engines, and consequently $\tfrac{1}{6}$th part of 800 horses power, or 133 horses power resistance against the piston. The allowance is less in the Cornish engine, on account of the pause between the strokes. The friction allowances must be made at pleasure. I conceive the mean power in crossing the Atlantic will not reach 600 horses power.

I remain your obedient servant,

S.

ON THE CAUSE OF EXPLOSION IN STEAM-BOILERS, AND THE REMEDY. BY MR. WILLIAM SAMUEL HENSON.

[We have in a former Number (493,) described an improved mode of working steam expansively, which forms the most important of "Certain Improvements in the Steam-engine," lately patented by Mr. Henson. Another of Mr. H.'s improvements consists in the application of a governor to the safety-valve of steam-engine boilers, by which the safety-valve is raised when the engine is at rest, and the danger of explosion from the sudden stoppage of ebullition in the boiler thereby prevented. The present paper explains Mr. H.'s views in this improvement; they are ingenious, shrewd, and original, and well deserving of attention. —Ed. *M. M.*]

I find by the Government Report on steam-vessel accidents, published in 1839, that, out of twenty-three explosions, nineteen occurred whilst the vessels were on the instant of starting, or were stationary; three whilst steaming; and the time when the remaining one took place was not ascertained. In two instances only was it proved that steam was blowing through the safety-valves at the time of the explosion, showing the valves to have had an insufficient area, being only from one-fourth to one-fifth of a square inch to each horse power, instead of one square inch, as recommended by the most eminent engineers. In the other seventeen cases of the nineteen, the ebullition had not been continued in the boilers while the engines stopped.

The greatest number of boilers have ruptured below the water-line, caused apparently by some sudden action under water. The most violent explosions have generally taken place just at the instant of setting the engines in motion after standing quiet some time with no steam escaping, and consequently no ebullition. These explosions have generally been attributed to the lowness of the water in the boiler, and the exposed parts getting red hot, whereby, when the water is agitated by the engine being set on, or by the safety-valve being suddenly opened, or even by the oscillating of the vessel, a thin sheet of water has washed over the

red-hot parts, causing, as suggested, the sudden formation of such an immense volume of steam, that no safety-valves could relieve the boiler in time to save it. But if ebullition had been continued when the engine stopped, this cause of explosion could not have arisen, as the ebullition would most probably have prevented the boiler getting red hot, at least those parts near the water. The water has been known to get very low while the engines were at work, without any accident happening, yet the same boilers have exploded whilst the engines were stopping, with every reason to suppose there was plenty of water, and the safety-valves not overloaded. In several instances it has been proved that a sufficiency of water has been in the boilers at the time of the explosions, and the vessels have performed in safety regular voyages across seas which required good seaworthy vessels and strong boilers, yet these boilers have exploded whilst preparing to start, or on the instant of starting from the quays or ports where they have been stopping, and weakness and insufficiency of stays has been attributed as the cause.

Many persons have contended that the extreme violence of some explosions is caused by the over-heated parts of the boilers decomposing the steam and generating a highly explosive mixture of gases. It is true that red-hot iron will decompose steam, but in doing this the oxygen combines with the iron, and the hydrogen alone is set free, which is not explosive by itself. In no instance, I believe, have the two gases been proved to be produced under these circumstances.

From various incidents I have been led to believe that there may be another cause of explosion which has hitherto escaped observation. I will endeavour to explain it as briefly as possible. It is well known that water boils, under the ordinary pressure of the atmosphere, at 212° Fahr., and that it takes about five times as long to convert a given quantity of water into steam at 212° as it does to raise the water from the ordinary temperature to the boiling point. It follows that this steam contains about five times the quantity of caloric to its equivalent in water, or, in other words, that the steam contains five times as much heat as it contained when in the state of water at 212°; but the additional heat is not sensible to the thermometer, because it is expanded throughout a greater space. Therefore, as every particle of water requires a much higher temperature than 212° before it can expand into steam, it appears that if heat could be communicated equally to every particle of water, and the water kept perfectly still at the same time, the water would attain a much higher temperature than 212° Fahr. before the whole of it flashed into steam. This I am aware is not easy to accomplish, on account of water at rest not being so good a conductor of heat as when in motion; and those parts which are hottest, being lighter than the other parts, will rise to the surface and disturb the stillness. This tendency of the most heated parts to rise to the surface causes a number of currents to move in various directions, and these currents appear to assist materially in the formation of steam, by enabling certain portions of water to concentrate sufficient heat in themselves, from the surrounding portions, to form steam.

I have found by experiment that water kept very still, and heat communicated gradually, it did not boil, although considerably above the boiling point; but upon agitating the water a little, even when the fire was removed, a portion of it instantly flashed into steam, driving some of the water with considerable violence against the upper side of the vessel, and a very brisk ebullition continued for a space of about a minute afterwards, until the temperature of the water was reduced to the boiling point. This experiment was tried at a low temperature, with a close vessel, from which the atmospheric air was excluded. The upper part of the vessel was kept at a low temperature (about 60° Fahr.) and the lower part heated very gradually by interposing dry sand between the fire and the vessel. I have by this means heated the water something more than 100°Fahr. above the boiling point. As it is very probable that the effect above described is produced equally at high temperatures, I think its violence is quite sufficient to account for some of the phenomena of steam-boiler explosions. Again, if a bottle containing a little cold water, or almost any other liquid, be corked lightly, and then shaken well, there will be sufficient vapour formed by the agitation of the water, and the escape of the gases contained therein, to blow out the cork. But to produce a still greater effect, put

a little water into a deep bottle and cork it up, leaving a small aperture open to the atmosphere, and then boil the water by means of a spirit-lamp; when the steam has heated the whole of the bottle, and escapes freely from the aperture, remove the bottle from the lamp; and when the steam has ceased to blow out, and the ebullition stopped, turn the bottle on one side, or give it a good shake, when a considerable volume of steam will instantly be generated, which will blow out the cork. This experiment shows the necessity of having a large surface of water for the steam to escape from in a steam-boiler, and the danger of allowing the water to remain quiet. I will also observe, that with a sufficiency of water in a boiler, and good safety valves, not overloaded, there is less danger with a brisk fire than with a slow one, as the former would continue the ebullition while the engine was stopping, by generating sufficient steam to force open the safety valves, thereby preventing the formation of great quantities of steam.

The sudden commencement of ebullition has also a tendency to strain parts of a boiler by the contraction of the iron arising from the cooling effect peculiar to evaporation at all temperatures. The well-known experiment of taking a vessel containing water boiling hard from the fire, and resting it upon the hand without pain, though it cannot be borne for a moment after the ebullition has quite ceased, is sufficient to prove this fact. The Americans appear to be well aware of the danger to their steam-engine boilers of stopping, without knowing whence the danger arises; but by disconnecting the paddle-wheels from the engine, they are enabled to stop the vessel without stopping the engine, though in this case a fly-wheel is necessary, or the engine would not work at all. But it is not requisite to continue the engine at work if a certain quantity of steam be allowed to escape; the effect in the boiler will be exactly the same as if the engine was at work, and water may be very readily supplied to the boiler without the assistance of the engine.

It is generally believed that explosions have taken place when there has been a sufficiency of water in the boilers at the moment of opening the safety valves suddenly, or of setting the engines in motion. I have already shown what may be the effects of the slow communication of caloric to the particles of water. I will now point out how the conditions necessary for that purpose are fulfilled in the generality of steam-boat boilers. The flues which contain the fire-grate, and conduct the heated air through the body of water, pass longitudinally through the boiler. The greater part of the heat is absorbed by the water on the top and sides of these flues, but still a considerable portion is absorbed by the lower side. When the engine is at rest, and no ebullition going on, that portion of water situated just under the flue, in consequence of being heated on the upper surface, absorbs the heat very gradually, without causing motion amongst its particles, because those portions on the upper side nearest the bottom being lighter on account of being hotter than the portions immediately underneath, have no tendency to cause those currents in the water which appear to assist so much in causing ebullition. Thus that portion of water directly under the flue becomes heated very considerably above the boiling point, and when any thing occurs, as the starting of the engine, &c., to cause agitation or vibration, a great body of steam is instantly formed, which impinges against the under side of the flue, and the bottom of the boiler. The water is by this means driven for a moment against the top of the boiler, choking up the safety-valves, and by the great agitation into which it is suddenly thrown, causing every part to give out an additional quantity of steam, whereby the under side of the flue, if not very strong, will probably be collapsed; and it is a fact that in most cases of collapse the flues have ruptured on the under side. The violent force with which the greater part of the water may be thrown against the upper surface of the boiler by this means, may account in some measure for the singular but well-known phenomenon of an entire boiler being lifted from its seat, and the great additional volume of steam which is given out by boiling water when violently agitated, may explain the fact of its bursting in the air.

From these experiments and investigations I have been led to form the opinion that if the ebullition in a boiler can be constantly kept up, explosion is not likely to happen; and to continue the ebullition, therefore, while an engine is

stationary, I have introduced the improvement above described, into the boilers of steam-engines.

PROGRESS OF FOREIGN SCIENCE.

[In continuation from page 203.]

The Gases evolved in Blast Furnaces.

On the 17th of January last, M. Ebelmen read a memoir to the Academy on his method of employing usefully the gases given off by iron furnaces when in blast, and on the constitution of these gases.

The chemical reader is probably aware that a good while ago M. Bunsen, of Marbourg, whose laborious, dangerous, and beautiful researches on alkarsin and its compounds, have made his name celebrated, conducted also a long course of experiments upon the gases evolved in blast furnaces.

The results both of his, and of Ebelmen's researches, though of considerable chemical interest, do not seem to have thrown much additional light upon the metallurgy of iron. The value of the economic applications of the combustible gases given off, as proposed by the latter, has yet to be proved.

Electro-chemical properties of Gold.

M. Becquerel has commenced reading to the Academy of Sciences of Paris, the first of a series of memoirs on "The Electro-chemical properties of the simple bodies, and on their applications in the arts." The first memoir is On Gold—it is of great length, and treats minutely of several of the most important operations in the metallurgy of this metal, methods of gilding, &c. When this series of memoirs shall be complete, a translation published in a cheap form would be a most useful addition to our scientific literature.

The new French Telegraph of M. Vilallougue.

This is the age of telegraphs and telegraphing. We have electric telegraphs for regaining our top-coats when left behind on the railways; and semaphores, to tell us the cream of the news as it comes across the Atlantic by steam; and we get the first of our news from India, whether good or bad, across France by telegraph.

The existing telegraphs in France consist of three arms, moveable in the same vertical plane; the principal arm, called "the regulator," carries at each end a smaller arm, called "an indicator." The regulator, moving on an axis in the middle of its length, is either horizontal, vertical, or at 45° of inclination; each indicator turning on its extremity, is perpendicular, or at 45° to the regulator, and never takes six positions with reference to the latter. Recently in some of the government telegraphs, the regulator has been fixed horizontally, and the place of its four positions supplied by a separate bar, placed above, and moving like the beam of a balance; this upper bar the French call "*mobile,*" for which it is not easy to find an English word.

M. Vilallougue's telegraph adopts the same principles of notation as this latter, but his mechanical arrangement is such as gives greater facility in working the machine, greater clearness in hazy weather, &c.; and enables the same instrument to answer as a day and night telegraph, with only the loss of two minutes time to change it from one to the other.

His telegraph tower is square, and painted black externally. On one of its faces it carries three large dials, like clock dials without figures, made of wood, or sheet iron, and moveable in a vertical plane round their respective centres. Each of these is about 9 feet in diameter. The two lower ones are placed side by side on the same level; the third is placed centrally and above them.

Below the two lower dials a bar of wood, painted white, is placed, behind which is an aperture of the same size into the interior of the tower. This bar is horizontal, and represents the fixed regulator of the present system. Each of the two lower dials has got a radius wide. The upper dial has got a diameter, painted white, upon it, of two decimetres painted white, upon it. Means are provided inside the tower for turning these dials on their centres in any way required, and by the respective positions of the diameter, with the two radii and the regulating bar, the signals are conveyed.

The opposite side of the tower carries a precisely similar set of dials, &c., whose axes are the same (*i. e.* on the same shafts) as the former, so that the signals are made on two faces at once; thus the watchman at the former, or last station, always sees what signals are making by the next telegraph to him to that beyond, by which he knows if his own signals

have been correctly seen and observed. So much for the day telegraph, which, in experiments made at Perpignan, was distinctly seen with telescopes magnifying from thirty to forty times, at 8000 metres distance, which is about the mean telegraphic distance. To convert this into a night telegraph, the white bars on the several dials, and the regulator bar, are movable, and in their place, when removed, is formed a band of a built lens, that is to say, a strip cut out of one of Fresnel's lenses, (the polyzonal lenses of Brewster,) by two planes, parallel and equidistant, from a diameter. The breadth of this *slice of lens* being equal to that of the white strip or band before spoken of, the interior of the tower is strongly illuminated by lamps like a lighthouse, or single attached lamps are placed in the focus of each band of lens, and the whole is now in a condition to work as a night telegraph.

The acknowledged difficulties of night telegraphs are thus much reduced, if not got rid of; and the whole instrument is worked free from the inconvenience of weather, &c.

It has also been found advantageous to substitute for the band of lens two simple glazed apertures at each end of the diameter in the upper dial, and at the extremities of the radii of the lower ones, and of the regulator. There appear to be several not inconsiderable advantages secured by this arrangement, which has been approved of by the Academy of Sciences, after having been reported on by a commission of its members.

New Method of Purifying Gas.

M. Mallet has had in operation for some time, at the gas-works at St. Quentin, a new method of purifying gas, which was described to the Academy of Sciences in August last. The results are said to give a gas of the highest purity, free from naphthaline, which is what makes the chief part of the smoke that blackens our ceilings, in our own gas from coal; and equally free from various ammoniacal compounds, which give much of the detestable smell to coal gas when it escapes. The gas at St Quentin, though candidly admitted by the inventor of this process of purification not to be absolutely without smell, has yet very little, and that scarcely, if at all, offensive. It would be very desirable if our own Gas Companies would adopt something of this sort.

Photography.

M. Nothomb has addressed a note to the Academy of Sciences, stating that he has found it advantageous to substitute proto-chloride of mercury in place of running mercury, (quicksilver,) as proposed by Daguerre. The proto-chloride is the calomel of the Pharmacopœia.

Dilatation of Elastic Fluids.

Most persons are aware, who follow the course of science, that the coefficient of dilatation of elastic fluids, which until a comparatively recent period had been assumed the same for every gas, and such that the dilatation was $\frac{1}{480}$ part of the volume for each degree of Fahrenheit's thermometer, has more recently been submitted to new researches by Regnault, Despretz, and others. M. Magnus is the latest experimenter in this field, and has not yet concluded his researches, which are of great value: he has, however, already ascertained that the coefficient of dilatation is not precisely the same for all gases, and that the difference does not arise from the easy condensibility of some, such as sulphurous acid, into liquids.

Nicotin.

The vegetable alkali of tobacco has been carefully prepared and analyzed, with experiments of controul by M. Barral: it is a colourless anhydrous fluid, which does not freeze at 10° cent.; it has a burning taste, and is volatile at 250° cent., and is a violent poison; a single drop placed on the tongue of a middle-sized dog poisoned him in three minutes. It reacts alkaline. Its composition is $C_{20}\ H_{18}\ Az_2$.

Coal in France.

The coal formation of the basin of the Soane and Loire has lately been described in a memoir by M. Burat, which is of considerable interest. The coal in this formation is different from any yet known, as to its mode of deposition: it is not regularly in beds, but rather in vast masses, which surpass in thickness or depth any thing previously known, but are of no great horizontal extent. In some places the coal is confounded with the other matters of the formation.

Artesian Well of Grenelle.

The public excitement in Paris, as to the formidable consequences which will result to the city from the well at Grenelle, unless speedily filled up, and which

has been produced by the absurd statements put forward with an air of science and authority by the public newspapers, has arrived at such a pitch, that the Academy of Sciences has deemed it requisite to notice it, and formally to refute the newspaper statements. It is a singular feature of society in France, and in Paris in particular, and is a theme for the politician and psychologist, that this people—so eminent for physical science, and alas! too, for the absence of religion—are so readily and so frequently put into absurd panics about expected or predicted dangers, either in the heavens above or the earth beneath them. Thus, a few years ago, Arago had to reassure them, in a formal essay in the Annuaire, to prove that Encke's comet would *not* smite the earth, and either burn or drown them; and now the Academy has to step forward to assure them that Paris will not be swallowed up in the immense gulf which the well at Grenelle will, they fear, wash out under the city.

The Daguerreotype.

M. Bisson has found that, by placing in the cup which contains the mercury, (in the Daguerreotype process,) a little alcoholic solution of iodine, the mercury and the iodine evaporate together, and give to the as yet invisible image, when produced, a tint much more agreeable and pleasing for portraits than those at present obtained, which certainly are most cadaverous-looking things.

STATE OF THE IRON TRADE.

(From the *Mining Journal.*)

We are enabled this week to furnish a tabular statement, showing the number of furnaces in and out of blast in the United Kingdom, with the weekly "make," in most instances taken from data on which no question can arise as to the accuracy of the returns, while, in other cases, we have adopted such estimates as appeared to us, from the information derived, to be sufficiently near for the attainment of the object in view—that of presenting to our readers a complete table, wherein the several iron works of the United Kingdom are classified, and the weekly product, as also the aggregate returns.

The following summary will at once exhibit the present position of the iron trade:

	Furnaces.	In blast.	Aver. weekly make.
South Staffordsh., 1st div.	87	54	4200
,, 2d div.	48	32	2475
North Staffordshire	18	12	620
Shropshire	36	24	1355
Derbyshire	15	14	577
Yorkshire	30	24	1059
Scotland	91	65	5525
Northumberland........	7	2	120
Durham	2	2	120
Forest of Dean	8	3	120
South Wales	162	112	9000
North Wales	21	6	360
Ireland	2	—	—
Total	527	350	25531

It will be thus seen, that the number of furnaces in the United Kingdom is 527, of which 350 are in blast, and 177 out of blast, the quantity of pig-iron made, or capable of being made, at the present time, (by the furnaces in blast,) being 1,327,612 tons per annum, from which, however, we may deduct 20 per cent.—leaving 1,062,090 tons as the actual make. On comparing this statement with an abstract of the quantity of pig-iron estimated to have been manufactured in the year 1839, and which is embodied in Mr. David Mushet's work, entitled "Papers on Iron and Steel," we find the average weekly make at that period to have been as follows:—

	Furnaces.	In blast.	Aver. weekly make.
South Staffordshire	126	106	6660
North Staffordshire	10	7	350
Shropshire	34	29	1555
Derbyshire	16	14	660
Yorkshire	29	24	1010
Newcastle-on-Tyne	5	5	250
Scotland	54	54	3790
Forest of Dean	8	5	350
South Wales	127	122	8730
North Wales	20	13	650
Total	429	379	24005

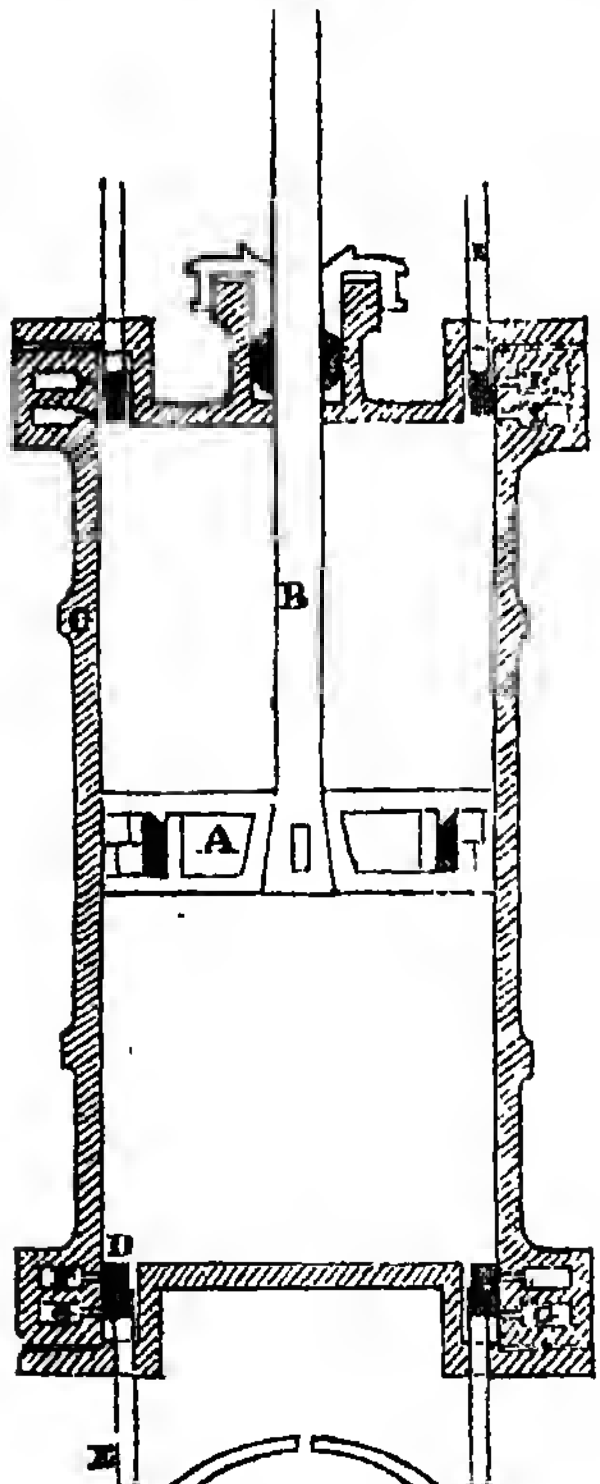
Or an annual "make" of 1,248,260, which is called in Mr. Mushet's work 1,248,781 tons. It will be thus seen that, comparing the present make with that of the average of 1839, the number of furnaces in that year was 429, of which 379 were in blast; whereas, in February, 1842, the number had increased to 527, of which only 350 were in work, the majority being at a reduced make of 25 per cent.—the aggregate quantity made weekly being, in 1839, 24,005 tons, and in February, 1842, 25,531 tons—there being an increase, in the past two years, of 98 furnaces, equal to an additional make of 407,680 tons per

annum, (about one-third the average make,) while the number of furnaces in blast in 1839 was greater than those enumerated as being in operation at the present time.

IMPROVEMENT IN SLIDE VALVES.

Sir,—I beg leave to inclose some sketches of a slide valve, which to me appears to be of a new construction, and to offer considerable advantages over those in ordinary use.

Fig. 1.



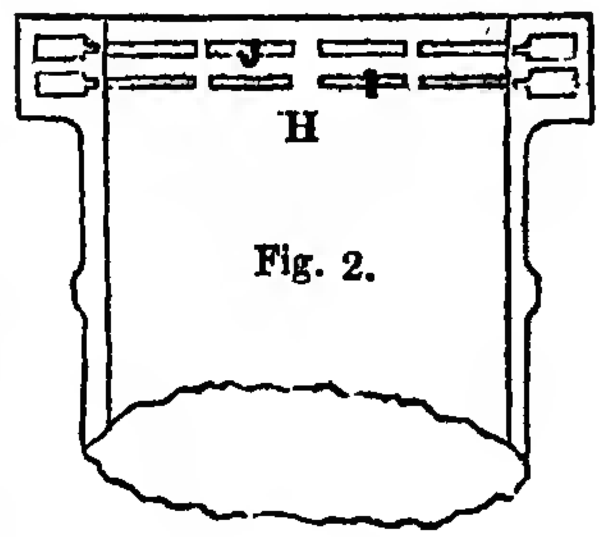
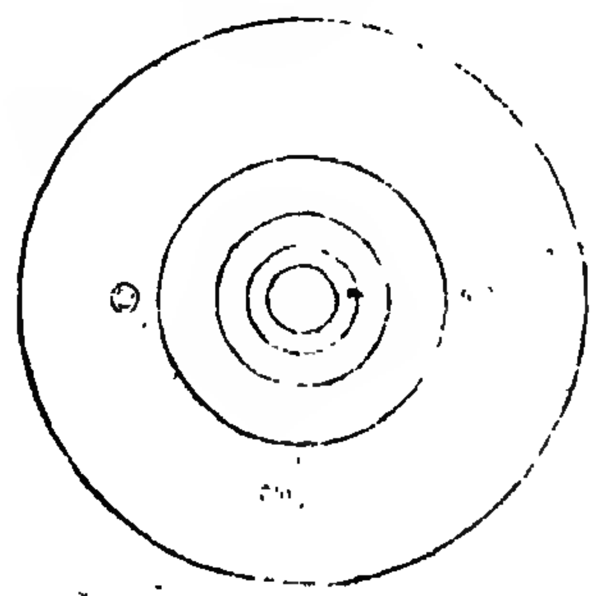


Fig. 2.

Fig. 4.



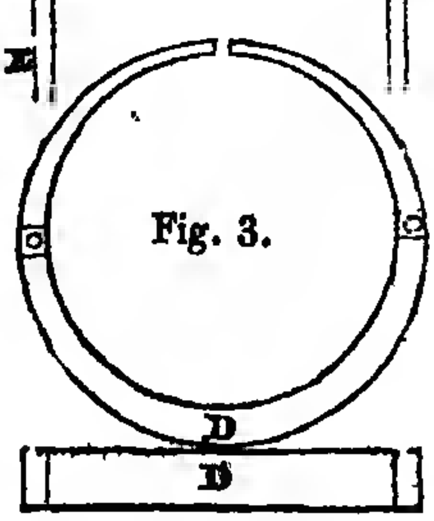


Fig. 3.

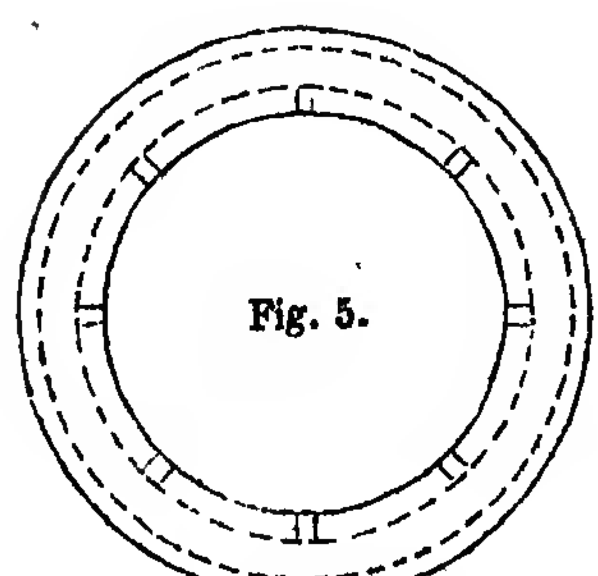


Fig. 5.

Fig. 1 is the section of cylinder valve, piston, &c. A represents the piston; B, the piston rod; C, the cylinder; D, slide; E, valve spindles; F, bottom steam passage around the cylinder; G, bottom exhausting passage; K, top exhausting passage; L, top steam passage.

Fig. 2, H is intended to represent a section through the ports, and steam-passage, &c.; I, is steam port; J, the exhausting port.

Fig. 3, D represents the valve, being a round ring.

Fig. 4, is the top view of cylinder cover.

Fig. 5, is top view of cylinder through the ports, showing the ribs.

The utility of this valve, consists in giving steam much quicker, in conse-

quence of the ports being all round the cylinder, and the valve travelling therefore about $\frac{1}{16}$th part the distance of the common D slide valve. It does away also with a deal of work, such as the D valve, valve jacket, packing blocks, &c. The steam may be also, by this means, worked expansively to a greater advantage than at present, as it is necessary to have an additional expansion valve for the present D valve, when it is desired to work steam expansively.

I am, &c.

THOMAS MERITON.

Mill Wall, January 27, 1842.

MR. C. W. WILLIAMS'S PATENT FURNACES—MESSRS. DIRCKS AND CO., AND MR. ARMSTRONG.

Sir,—Our attention has been called to a letter from Mr. R. Armstrong in your Journal of the 5th March, in which a slight is attempted to be thrown on us, merely in consequence of our acting as principal agents for the argand furnace of Charles W. Williams, Esq.

We are quite satisfied in our own minds that no unprejudiced party can read the communication alluded to, without being convinced that all sober argument or scientific inquiry is at an end with an individual who can descend to the style of that letter. Such is our impression, and much as we feel disposed to make a few remarks on the unwarranted assertions of Mr. A., we shall refrain from so doing, not only from entertaining this opinion—of itself sufficiently strong—but also for the following, if possible, more cogent reason. We decline entering the lists with Mr. Armstrong, he having within the last fortnight declared, in the strongest language, the most implacable hostility towards Mr. Williams, and a determination to attack him, and whatever emanates from him, by every means in his power. We state this coolly and advisedly, and are prepared to support the assertion.

It is not, therefore, from our being unable to controvert Mr. A.'s statements, but from a wish to keep free from his personal abuse, and a contest in which none but an interested party can feel any concern, that we decline taking further notice of the letter in question.

We are, Sir,

Yours, &c.,

DIRCKS AND CO.

Manchester, March 1842.

VARIATION OF THE NEEDLE—GREENWICH MAGNETIC OBSERVATORY.

The needle is known to have had a westerly variation ever since about 1657. The late Colonel Beaufoy, who made a long series of very skilful and accurate observations on the subject at Bushy Heath, about ten miles N.W. of London, considered that he had ascertained that in March, 1819, this variation had attained its maximum, being then 24° 41′ 42″ W., and that it had begun then to decrease at an annual rate of 1′ 37″. A writer in the Quarterly Review makes the retrocession contemporaneous with the great breaking up of the Polar ice in 1816 (three years earlier than the date assigned by Colonel Beaufoy), but not on any sufficient authority. In 1839 a Magnetic Observatory was added to our national Greenwich establishment, and the observations which have been since made there, under the superintendence of the Astronomer Royal, Professor Airy, confirm the general correctness of Colonel Beaufoy's conclusions, though they indicate the annual decrease to be greater than he supposed. The results obtained for the last two years are as follow:—

1840	23° 23′ 30″ W.
1841	23° 17′ 40″ W.

The Magnetic Observatory at Greenwich is erected on a piece of ground adjoining Flamstead House. The following description of it is given by the author of an interesting article, "On Telluric Magnetism" in the *United Service Magazine* for March last:—"It is entirely built of wood, and completely insulated. The free magnet is a bar of hard steel, 2 feet long, 1½ inch broad, and ¼ inch thick, suspended by a skein of silk fibre from two pulleys fitted to a suspension frame about 9 feet above it. Before the magnet there slide two small brass frames, firmly fixed in their places by means of pinching screws. One of these contains, between two plane glasses, a cross of delicate cobwebs; the other holds a lens of 13 inches' focal length, and nearly 2 inches' aperture, which combination serves as a collimator without a tube, and perfects the adjustment."

THE ATMOSPHERIC RAILWAY.

Opinions of Professor Barlow and Col. Sir Frederick Smith, R. E.

A Report has been laid before Parliament, which was made to the Board of Trade on the 15th of February last, by Professor Barlow and Sir Frederick Smith, on the merits of the atmospheric system of railway, invented

and patented by Mr. Clegg, and fully described in our 882nd Number. The opinion of these two highly competent authorities is decidedly favourable to the adoption of the system. They sum up their Report by declaring—

"1. That we consider the principle of atmospheric propulsion to be established, and that the economy of working increases with the length and diameter of the tube.

"2. That the expense of the formation of the line in cuttings, embankments, bridges, tunnels, and rails, will be very little less than for equal lengths of a railway to be worked by locomotive engines; but that the total cost of the works will be much greater, owing to the expense of providing and laying the atmospheric tube, and erecting the stationary engines.

"3. That the expense of working a line on this principle, on which trains are frequently passing, will be less than working by locomotive engines, and that the saving thus effected will, in some cases, more than compensate for the additional outlay; but it will be the reverse on lines of unfrequent trains. However, there are many items of expense of which we have no knowledge, and can form no opinion, such as the wear and tear of pistons, valves, &c.; and on these further experience is needed.

"4. That with proper means of disengaging the train from the piston in cases of emergency, we consider this principle, as regards safety, equal to that appertaining to rope machinery. There appear, however, some practical difficulties in regard to junctions, crossings, sidings, and stoppages at road stations, which may make this system of less general application."

NEW STEAM-ENGINE ERECTED BY MESSRS. RENNIE, AT MR. CUBITT'S FACTORY, THAMES-BANK.

The two cylinder expansive engine invented by Hornblower, and afterwards, with but slight modifications, brought into extensive use by Woolf, is well known to all persons acquainted with the history of the steam-engine. The cause, also, of its subsequently falling into disuse is no secret; it was found to perform no more duty with two cylinders than could be done at much less cost with one. Not that more duty was *previously* done with one cylinder, but that in the progress of improvement it was discovered, or supposed to be discovered, that steam could be worked expansively as well with one cylinder as with two; and so the cost of the second cylinder, and the extra friction and radiation attending the use of it saved. Abandoned in Cornwall, where it first found favour, and long maintained a strong hold on public opinion, it has now, strange to say, been reproduced in the metropolis by engineers of the first eminence; and, stranger still, with a degree of success which, if there be no mistake in the case, shows not only that it has been most undeservedly shelved by its Cornish patrons, but that it is in truth the best sort of engine which has ever yet been constructed.

The engine which has thus taken the engineering world by surprise is one which has just been erected by the Messrs. Rennie, at the extensive manufactory of Mr. Thomas Cubitt, Thames-bank. It differs in no respect, as far as regards details and arrangement, from the ordinary rotative engine of Woolf; nor is any such difference claimed credit for by the makers. There are the two cylinders, side by side, as of old—a small one, into which the steam first passes at a high pressure from the boiler, and a larger one, into which it expands (five times); also the ponderous beam, fly-wheel, rotating shaft, &c. The only difference we could observe consists in the workmanship, which is of a very superior description, and in a little better clothing (perhaps) of the cylinders. The effective working power is stated to be equal to 60 horses, and the consumption of fuel to be *no more than 2·2 lbs. per horse power per hour*. It is this which is the startling result. So small an expenditure of fuel has never been before reached by any rotative engine, of any description; not even by the same sort of engine, when in the friendly and fostering hands of Woolf. That it has been actually realized in the present instance by virtue merely of better workmanship and better clothing, no person can be expected to believe, except on the most indisputable evidence; and such evidence the respectable manufacturers of the engine will, no doubt, themselves allow still remains to be furnished. We were assured that it was doing the same work which two or three old engines, of the cumulative power of 60 horses, had been in use to perform, and have no reason to question the fact; but that, evidently, is a very uncertain test of its real power. We were also shown indicator diagrams, which exhibited a very small average deficiency of pressure; but the insides of steam cylinders and working shafts, as all the world knows, often tell very different tales. The means taken to keep a correct account of the quantity of fuel consumed, (Welsh coal,) appeared to be also most unexceptionable; and if we could only admit 60 to be the proper divisor to employ, we make no doubt of 2·2 lbs. per horse power per hour being a true result.

Proof, however, of the 60 horses' power is still wanting—such direct and positive proof as *actual performance* alone can supply, and that not during short trials of an hour or a day at a time, but during trials carried on for several days successively, and under the same circumstances, precisely, in all respects.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

MILES BERRY, OF CHANCERY-LANE, CIVIL ENGINEER, *for certain improvements in the means and apparatus for obtaining motive power, and rendering more effective the use of known agents of motion.* (A communication.) Rolls Chapel Office, February 28, 1842.

These improvements, like all the other wonder-working contrivances of this class, professing to obtain power, set all the established laws of matter and of motion at defiance. If any reliance at all is to be placed upon the statements which compose this voluminous specification, the patentee has discovered the long sought-for "perpetual motion;" but he does not seem to be aware of the fact.

The improvements are said to relate to certain means and apparatus intended for the production of motive power, and consist principally in the employment of water, or any fluid, such as air, which is introduced as an agent between the prime mover which acts upon it, and the object against which the force or power ought to act, and by means of the novel arrangement of parts, a better application of motive power is obtained.

A horizontal circular plate, or wheel of iron, wood, stone, or other suitable material, is furnished near its outer edge, with a groove or channel, in which is laid a flexible tube; at short intervals, the horizontal plate is perforated with holes, through which, supply-pipes, furnished with valves opening upwards, are led into the flexible pipe before mentioned. The water, or other fluid being supplied under pressure, rushes into and fills the flexible pipe, which is to be very strong and made double, of leather, or other water-proof fabric. A heavy vertical wheel travels round the horizontal plate immediately over the flexible pipe, pressing before it the water contained in the pipe, which is forced through an exit-pipe, and is lead to some suitable machinery to which it gives motion. In the specification, a revolving spiral wheel, on the principle of Barker's mill is recommended—Whitelaw and Stirrats' is no doubt intended.

In order to communicate the requisite pressure, the following novel expedient is resorted to by the patentee; "to the axle around which the weight-wheel revolves, a double steel-yard is adapted, and at the end of the steel-yards, or levers, are suspended certain weights, *which by their distance from the point of support multiply the weight!* So, that if the wheel be required to press with an effective weight of 8,000 lbs., and the wheel and its appurtenances weigh but 2,000 lbs., a weight of 1,000 lbs. is to be attached to the extremity of each of the two levers: we shall then have for a weight of 2,000 lbs. an effective weight of 6,000 lbs., if the levers from the centres to their extremities are three times the length of the radius of the wheel!!

The advantages of this system are said to be that the application of the power which is obtained by it, allows such power, whatever it may be, to be multiplied *ad infinitum*, as it has been ascertained, that in order to propel a weight-wheel of 3,000 lbs. weight, (supposing the resistance that the water in the flexible tube offers to its progress is equal to that which motive power encounters on paved roads,) it will be necessary to expend 75 lbs. of power. Therefore, for 75 lbs. of power expended in propelling the weight-wheel, a disposable power of 3,000 lbs. weight will be obtained by the water at the end of the exit-pipe: which water acting, for example, upon a spiral revolving wheel, will allow the latter to propel one or more wheels of 120,000 lbs. weight, which wheels acting on one or more flexible pipes, will generate power by consecutive series *ad infinitum!!!*

The Barker's mill is set forth as an example, being considered to give out the greatest useful effect, but any other form of machinery may be employed in lieu thereof; or the issuing column of water may be projected in a jet for extinguishing fires, or for other hydraulic purposes.

For pumps, or fire-engines, the apparatus is to be placed under ground, near the building to be protected.

The apparatus is next shown as applied to the propelling of vessels. In one case, the weight-wheel revolves round a circular plate as before mentioned; in another, it traverses backward and forward, expelling the water alternately from the bow and the stern.

Another form of apparatus is then described; it consists of the cylinder of a steam-engine, which, instead of acting upon a crank to produce rotary motion, acts by means of its piston-rod upon another piston in a second water cylinder, the water being forced through a Barker's mill, or other rotary machine, *a little soap being added to the water to reduce the friction!*

By this means, says the patentee, a more

uniform rotary motion may be obtained, the dead points avoided, and also the necessity for great speed in the steam-piston avoided. A modification of the slide-valves supposed to be necessary for this purpose is described at length.

The application of a similar apparatus for propelling vehicles of various kinds is described, but no particular scale is given for the construction of the apparatus, as the proportions and dimensions may be varied. The patentee merely advises that the running wheels should be made much larger than they are at present, (query, how much larger than 7 feet?) and that the steam piston should exceed in size that of the water cylinder.

The construction of a locomotive engine on the principle of the traversing weight-wheel is next set forth, but it is said to be inapplicable to rapid motion; it is, however, admirably adapted for carts, wagons, ploughs, &c. To ploughs so propelled, the patentee proposes to prefix a horse or bullock for the purpose of turning them round at the end of the furrow!

The claim is, 1. To the employment of a weight-wheel revolving and pressing upon a flexible pipe, or chamber full of either water, air, or other fluid, for the purpose of obtaining a continuous and forcible flow, or jet of water, or air; also the manner in which the said fluids are brought under the pressure of the weight-wheel, although it is effected through the agency of valves similar to those used in pumps, I consider as novel, as well as the way of constructing the flexible pipe. 2. To imparting a pressure to water by means of two cylinders, one containing steam, the other water, as above described, as well as the employment of weight-wheels, mounted on an axle, for the purpose of propelling locomotive carriages or boats. 3. To the motion given by the water to the slide-valves which direct the steam; and an application of these to any other purpose will be considered an infringement of this part of the invention. 4. To the tubes, through the agency of which the machinery is propelled, either upon the land or water, by introducing into them either water under considerable pressure, or compressed air.

Frederick de Moleyns, of Cheltenham, *for certain improvements in the production or development of electricity, and the application of electricity for the obtainment of illumination and motion.* Enrolment Office, Feburary 21, 1842.

These improvements consist—Firstly, In the production of electricity by certain novel combinations of known substances, whereby the electric power is largely developed by small quantities and superficies of those substances, with the important advantages of nearly perfect freedom from the noxious effluvia arising from certain combinations previously known, and avoidance of the use of mercury, and of undiluted acid, and the preservation of equal power for a long period.

Secondly, In the application of the electric power or principle, however obtained, to a new and improved mode of producing electric light, whereby that light may be sustained and increased, so as to make it available for lighting apartments, or for any other illuminating purpose.

Thirdly, In the application of electricity in its voltaic form when developing magnetic power in iron, to the production of a motive force of increased effect by means of improved modes of producing magnetism in iron, and of arranging and constructing the electro magnets.

The mode in which the first improvement is carried out, is described at great length, but it is briefly as follows:—One pound of nitrate of ammonia is dissolved in twelve ounces of soft water; to any given quantity of this solution an equal quantity of pure sulphuric acid is added, the solution being placed in a vessel containing pounded ice or other frigorific mixture, and the acid added very gradually to prevent heating. This mixture is then put into a stoppered bottle ready for use. A saturated solution of hydrochlorate of ammonia is also prepared. The battery consists of a glass, porcelain, or other suitable vessel, the internal measurement of which, is 3 inches by 2½ inches, and 3½ inches deep; in this is placed a piece of Mosselman's zinc, within which, and resting upon it, is a cell of seasoned sycamore, or porous biscuit ware ¾ of an inch in diameter, and the breadth and depth of the zinc which surrounds it. Within the cell is suspended by a binding screw from a brass bar, which crosses and rests upon the top of the outer vessel, a piece of thin sheet platina.

This battery is put into action by pouring some of the nitrate of ammonia and acid solution into the cell holding the platina; and a saturated solution of muriate of ammonia is poured into the glass vessel in contact with the zinc. A binding screw with a copper shank, is riveted (in preference to soldering) to the zinc, and on closing the voltaic circle, the battery is in powerful action, which may be kept undiminished for a considerable period. For producing an available light by means of electricity, a strong glass globe is furnished at two opposite points with openings closed by brass caps, through one of which, a vacuum can be formed within the sphere. The upper orifice has a glass or other insulated tube, which passes down

through the cap, and reaches nearly to the centre of the sphere; this tube is made to taper at its lower end in a cone-like form, so that its lower opening does not exceed the eighth of an inch in diameter. A thick copper wire passes down through this tube, working in air-tight collars in the brass cap, and reaches to within a quarter of an inch of the conical end of the tube, where it is united to a piece of fine platinum wire; this platinum wire, which is coiled in a spiral form like a corkscrew, passes through the opening of the tube and projects into the centre of the globe. Opposite to this wire, which forms one of the electrodes of the battery, is another thick copper wire which passes through the opposite brass cap, and terminates in a fine platinum wire similar to the former, only that it contains a small piece of spongy platinum. The upper glass tube is filled with finely powdered box-wood charcoal, or plumbago.

On completing the connexion between the two electrodes of the battery, the charcoal powder or plumbago falls in a minute shower upon the platinum wires and ball, and a continuous and intense light is given off. The dimensions of the platinum wires are to be so adjusted to the power of the battery, as to become intensely heated, but without being fused.

Two modes of constructing electro-magnets are next described, by means of which, the patentee states, from a given weight of iron more attractive power may be obtained, than has been hitherto developed in any other form. In the first mode of construction, thick copper or other wire, properly covered, is laid upon a strip of sheet iron, and the iron is rolled up into a cylindrical coil enclosing the wire. In the second mode the wire is coiled round a small soft iron cylinder, which is placed within another a size larger; wire being coiled round the second cylinder, it is placed in a third: and so on *ad infinitum*,, until any required degree of power is obtained.

In order to apply the above described, or other electro-magnets to the production of power, a series of electro-magnets are placed through circular holes at regular distances all round the felloes, or rim of a wheel fixed in a metal or other frame, and parallel to its axis. An equal portion of each magnet projects at either side of the rim of the wheel, and fixed in frames on each side of the wheel and parallel to it are a similar number of electro-magnets corresponding in size and strength to those in the wheel. The spokes of the driving-wheel are of sufficient substance to admit of a certain number of straight electro-magnets being passed through them, also parallel to its axis; and in the frame on each side of this wheel are fixed electro-magnets radiating from a centre formed by the axis of the driving-wheel, which work in the frame, and in their relative distances from each other, corresponding with the magnets fixed in the driving-wheel. The poles of the magnets in the frames are opposed to the poles of the magnets in the wheel, during the revolution of which attraction is converted into repulsion, by a change in the polarities of the fixed magnets, effected by a commutator worked by the wheel. The patentee states that he should prefer suspending, or cutting off the magnetism, to changing of the poles, but that he is prevented from using that expedient in consequence of its having been previously patented. The fixed magnets are worked by one battery, and the moving, or wheel magnets, by another.

The claim is, 1. To the development of the electrical principle by means of a combination consisting of a liquor composed of nitrate of ammonia, or nitrate of potassia, or other soluble nitrate, water, and sulphuric acid, in the proportions before described, or in other proportions, in association with platina, or other negative metal, or precipitate of one metal upon another, or upon other substances, not metallic, which may be substituted for the metal, and which is capable of resisting the action of such compound liquid; and further consisting of a saturated aqueous solution of muriate of ammonia, or muriate of soda, or other soluble muriate, or sulphate, or nitrate in association with zinc, or other positive metal—the whole forming a voltaic circle or combination, consisting of the acidulated nitrate solution, platina—saturated solution of muriate of ammonia, zinc—with the addition of a wooden, or other diaphragm. Also the compound liquor of which nitrate of ammonia, sulphuric acid and water form the ingredients, in the proportions set forth, or in varying proportions; or of which a different soluble nitrate, a different acid, and water, are ingredients, inducing, however, when combined, a similar play of chemical affinities, during the development of electricity in a closed voltaic circle.

2. To the application of electricity, whether produced by the foregoing contrivance, or by other means, to the development of a sustained light by the mode before set forth and explained; that is to say, by the use of pulverized charcoal, or plumbago, in connexion with fine platinum, or other wire, or spongy platinum, or both; and also the mode, or mechanical means by which the charcoal, &c., is brought into contact with the platinum, or other metallic electrode.

3. To the two modes of forming powerful electro-magnets, before described, and also the particular modes of arrangement of the said improved electro-magnets, or other forms of electro-magnets in the electro-magnetic engine.

4. To the particular mode of construction of the motive apparatus before described and set forth, as intended to convey motive force to machinery, and to display the greatly increased force produced by the described arrangement of electro-magnets.

EDMUND MOREWOOD, OF HIGHGATE, GENTLEMAN, *for an improved mode of preserving iron and other metals from oxidation or rust.* (A communication.) Enrolment Office, Feb. 26.

This invention consists, first, in tinning the metal, to be preserved, and then in zincing the tin, so that both the tin and zinc shall have a combined influence in preserving the metal.

The iron is first tinned by any of the methods now in use. The coating of tin, after having become hard, is well cleaned; the tinned metal is then immersed in molten zinc, its surface being carefully skimmed and covered with powdered sal-ammoniac. The tinned metal is suffered to remain in the molten zinc (which should be kept as near as possible at the melting point) until, on drawing it out slowly, the surface presents a smooth and even appearance.

Almost immediately after being taken out, and before the coating has become set and hard, the coated metal is immersed in clear water, then scrubbed and cleaned therein, and afterwards dried in bran or sawdust.

The claim is, to the preserving of iron and other metals capable of being tinned, and fusing at a temperature of not less than one thousand two hundred degrees of Fahrenheit, from oxidation, by tinning them and then dipping the tin covering or surface into molten zinc; or otherwise coating the tin covering with zinc in such manner that a union or contact shall take place between the surfaces of the zinc and tin, whereby a united influence is caused to be exerted for the preservation of the iron or other metal. This influence the patentee believes will prevent the destructive influence of the tin upon the iron when tin alone is used, and tin lessens the destructive influence of the iron upon the zinc, when zinc alone is used to cover the metal.

THOMAS CHAMBERS AND FRANCIS MARK FRANKLIN, OF LAWRENCE-LANE, LONDON, AND CHARLES ROWLEY, OF BIRMINGHAM, *for improvements in the manufacture of buttons and fastenings for wearing apparel.* Enrolment Office, Feb. 26.

The first part of this invention relates to the shanks of buttons. A piece of metal is stamped or bent so as to present the appearance of a small cross supported on four upright legs, each leg terminating in a horizontal projection or foot. In applying this shank to buttons the "collet" at the back of the button has an opening in the centre to allow the cross part of it to pass through, the feet remaining within the button, and preventing the shank being drawn through the opening. The button can be covered in the usual manner.

The second part relates to another form of shank to be applied to covered buttons. A circular disc of metal perforated with four holes is sunk in the shape of a hat, and the rim, or flanch, prevents the shank from being drawn through the hole in the collet when the centre part is protruded through it.

The third part relates to forming the collet or metal back of covered buttons of steel, so that it will lap over or cover the edges of the button. The covering is made on the front shell of the button, and the collet is made with a rim turned up; the covered shell is then put within the rim, and the rim closed over its edge.

The fourth part relates to a mode of constructing buttons with movable shanks, formed like the one last described, only, that instead of having a circular flanch to prevent its being drawn through the collet, it has two arms in a line with each other, one of which has a small stud fixed in its extremity. The collet has an opening to receive the centre part of the shank and one of the arms, and another hole to receive the stud in the shank. Inside the shank hole is a disc of metal attached to a spring, which is enclosed between the shell and the disc, so that the disc will be pressed against the collet. To fix the button to the shank, one of the projections of the shank must be pressed under the collet; so that the projection with the stud may enter the opening, then, by turning the button one quarter round, the stud will go into the hole in the collet made to receive it.

The fifth part relates to an improved mode of making vest bands. The folded edges of the fabric of which the bands are made, are cemented together (instead of being sewn) by common flour paste, dissolved India rubber, or any other convenient cement.

The sixth part relates to constructing vest bands with eyelet holes or loops formed from one piece of metal, in lieu of having each eyelet hole affixed separately in holes formed in the edges of the bands. A piece of wire is bent at regular intervals in the form of eyes; the straight parts of the wire being secured in the edge of the band while the eyes project beyond it.

The seventh part relates to a method of imparting elasticity to vest bands, and consists of a flat metal bar having two slots in the direction of its length, divided in the centre of the bar by a narrow cross piece of the bar itself. Two springs are formed around the bars, each spring being as long as one of the slots. The bar with its springs is enclosed within the fabric of which the vest bands are formed, and stitched all round. At the end of each spring, next to the centre of the bar, is a small stud, which passes through the slot of the bar and the double casing of the vest; by this adjustment, when the ends of the vest are drawn in a direction to separate them, the studs compress the springs, which offer an elastic resistance.

The eighth part relates to an apparatus for fastening stocks. A ratchet bar is fixed to one end of the stock, and a plate having a socket fixed thereto on the other. On the top of that socket is a spring fixed to the plate at one end and having a stud at the other; a projecting edge of this spring passes through a slot in the top of the socket, and catches one of the notches in the ratchet bar, thus holding the bar in whatever position it may be forced into the socket.

The ninth part relates to a mode of constructing elastic fastenings for stocks. This fastening is somewhat similar to the vest-band spring described in the seventh part of these improvements. Sometimes an India-rubber strap is used.

The tenth part relates to a mode of constructing fastenings for straps or trousers. On each end of the strap a metal plate is riveted, having a slot formed in the centre part and a groove on each side. To the trousers are affixed other plates, each of which has a flat spring attached to it, with its edge turned down so as to fit into the slot of the strap-plate, thus acting like hooks and securely holding the parts together until the plate in the strap is slided sideways, by which the groove on one side of the slot will raise the hook of the spring out of the slot and release them.

The eleventh part relates to an improvement in breast-pins, and consists of a projecting point affixed to the stem, and turned up towards the head of the pin. The stem of the pin is forced into the neckerchief, or shirt-front, as far as the lower part of the guard; the pin must then be raised, so as to cause the guard to enter the neckerchief; in the event of the pin being raised with the intention of removing it suddenly, the guard will prevent it.

The twelfth part relates to an improved loop or eye, to be used with hooks in fastening parts of garments. It consists of a piece of wire slightly bent in the form of a crank, so that it is attached to the garment by the two ends, while the hook takes into the bent part which projects beyond the edging.

The thirteenth part relates to a mode of making bands for drawers, so that they can be fastened in various positions. The novelty (?) consists in applying a series of eyelet-holes and hooks; the band being graduated by a series of rows of holes, the hooks can take into any of such holes, and the band be retained tightly round the person, rendering strings at the back unnecessary. In place of eyelet-holes, rings may be affixed.

The fourteenth part relates to a mode of applying elastic India rubber straps to children's shoes, in place of the leather, or non-elastic straps heretofore used. The two ends of the strap are fastened by a hook and eye, or other convenient means. Another very questionable novelty!

The fifteenth part relates to a mode of making brace and other buttons of the vegetable matter called "ivory-nut," or "vegetable ivory," instead of common bone or ivory.

Joseph Cooke Grant, of Stamford, Ironmonger and Agricultural Implement Maker, *for improvements in horse-rakes and hoes.* Enrolment Office, March 8, 1842.

This improved horse-rake consists of a short, but very wide quadrangular frame, mounted on a pair of wheels, and drawn by shafts in the usual manner. Within the frame a series of arms are placed side by side, throughout its whole width; each of the arms is driven into a cast-iron socket, and a bolt passing through the whole forms a joint or axle on which they are free to vibrate. At the opposite end of the arms is placed a curved tine or tooth, the curve being continuous, and nearly conformable to the arc described by the end of the arm. Each of the arms is connected with a beam lying along above them, and resting on suitable stops, by means of short chain links or other free connexion, so that when this beam is lifted, it raises the whole of the arms and tines. This beam is attached to a pair of levers moving on fulcra attached to the framework of the machine, the inner extremities or ends of the levers being attached by means of connecting-rods to a second lever or levers, which are jointed to the front of the machine, and, passing over the whole, terminate in a handle behind it. On pressing down this handle, the second system of levers is acted upon, which raises the beam, and with it the arms and tines or teeth of the rake, which, from their peculiar curved form, readily free themselves from any accumulations of hay, straw, &c. A catch is provided for holding up the teeth when the rake is travelling from one field to

another. The horse-hoe is constructed in a similar manner to the foregoing, the hoes taking the place of the tines or teeth, and being elevated in the same way.

The claim is, 1. To the mode of connecting the arms of horse-rakes with the axis, by applying the combination of cast-iron sockets, as described; 2. To combining the independent arms of horse-rakes with curved tines or teeth; 3. To the application of the combined motion of two levers working on different axes, in combination with the long bar, to facilitate the lifting of the tines or teeth of horse-rakes; 4. To the application of a lever to horse-rakes, when so connected with a bar for raising the tines or teeth, as to require the lever to be depressed in order to lift the tines or teeth; 5. To the mode of applying the compound lever action to the bar of a horse-hoe, having independent arms as above described.

NOTES AND NOTICES.

Mule-spinning.—Mr. Horner, one of the Factory Inspectors, states in a recent Report, that in a mill in Manchester, where they spin the finest number of yarns, one man now works, by means of eight double-decked mules, the amazing number of 2,592 spindles.

The *Mammoth* steam-vessel, which has been so long building at Bristol, by the Great Western Company, but which is now, it seems, to be called the *Great Britain*, is expected to be ready to be launched in March, 1843.

Magnetism Extraordinary.—The following singular case of magnetic attraction is stated, in *Silliman's Journal*, to have occurred in the State of Maine. A bed of magnetic iron ore magnetized so powerfully the instruments used to break it up, as to adhere to them in large tufts of the fragments of the iron ore; and a crow-bar, suspended freely over the iron ore, took the position of the magnetic meridian, so as to become in fact a true, though gigantic needle!

Draining Machine.—At the last meeting of the Agricultural Society, Mr. J. G. S. Lefevre presented, on the part of the Board of Trade, an American draining machine, invented by P. D. Henry, of New Orleans, U.S. The object of this machine is to raise water from a low place to a higher one, and the inventor proposes to accomplish this purpose by means of a hollow revolving hydraulic wheel, placed vertically at one-third its depth in the water, and divided into scooped compartments provided with valves which, as the wheel turns round, admit the water and retain it until a certain elevation above the surface has been attained, when the inclosed water falls back along radiating compartments towards the centre of the hollow wheel, and is carried away by a cylinder in a continuous stream. Mr. Henry enters into a detailed account of the particular arrangements by which this effect is produced in the most economical and efficient manner, and claims as the peculiar merit of his invention, the tangential manner in which the compartments of the hollow wheel are arranged in reference to the cylindrical conduit through its centre, and the contrivance of the spoons for scooping up the water when the reservoir is low. Above the hydraulic wheel, when in use, is placed a man on a framework, who causes the great wheel to revolve, by turning the handle of cog-wheels acting on its circumference; and the inventor states that he found a wheel of 6 feet in diameter, constructed on this principle, and worked by one man, capable of raising 200 gallons of water per minute.—*Athenæum.*

Suppression of the Smoke Nuisance.—At the usual monthly meeting of the Commissioners of the Birmingham Street Act, on Monday last, on the minute in reference to the subject of an inquiry as to the best means of effecting an abatement of the smoke nuisance, having been read, Mr. Turner said that the committee were not prepared to make any report, but he was happy to inform the commissioners that the nuisance so long complained of in Birmingham, arising from the smoke of steam furnaces, was in a fair way of being done away with. The patent of Mr. Williams (of which Mr. Dircks was the agent) had been tried at Mr. Clifford's mill, in Fazeley-street, with the most complete success; and he believed that if the principle were generally adopted, the complaints in reference to this subject would not only be put an end to, but that a considerable saving would be effected by mill owners and manufacturers in the reduced consumption of fuel; he thought it was the duty of those commissioners who had furnaces, to give the plan a fair trial, and thus set an example to others in abolishing a nuisance in Birmingham which had become almost intolerable.—*Mining Journal.*

Clyde Steamers.—"What do the champions of Thame supremacy in steam-boat building say now to Clyde-fitted steamers? The *Tay*, of the West India Company, and the *Princess Royal*, Liverpool and Greenock passage-vessel, have, I think, proved that the new theory of the wave current water-lines has been no fallacy. Of four vessels, namely, the *Clyde*, the *Teviot*, the *Solway*, and the *Tay*, the performance, (under circumstances in all respects similar,) has been exactly in the order in which the theoretical curve was more or less introduced in their construction; while that of the *Princess Royal*, regarding which there were no controlling circumstances to prevent its fair adoption, has not been equalled even by Mr. Smith's *Fire King*."—*From a Correspondent.* [The question of rivalry between the Thames and Clyde steam-boat builders has always turned less on the comparative correctness of their lines of construction, than on the degree of engineering genius and skill which they have respectively shown. The four vessels referred to may be the best moulded that ever yet ploughed the deep, and yet their engines be nothing to boast of. However, we gladly take this opportunity of bearing witness to a vast improvement, of late, in the workmanship of the Clyde-built engines; though still, as before, the Thames makers keep the lead, in all that relates to reduction of weight and space, and increase of effective working power.—ED. M. M.]

The Anti-John-Scott-Russell is the fantastical name very rashly given to a small steamer which may at the present time be occasionally seen on the Thames, testing the capabilities of a new rotary engine invented by Mr. Beale. Mr. Russell may possibly be wrong in saying that there is nothing to be gained, in any case, by the substitution of rotary for reciprocating or oscillating engines; but, from what we know of Mr. Beale's whirligig, we should not say that the Scotch Professor's reputation for sagacity has much to fear from its performances. It was enacting wonders when we saw it—for *five minutes*—but *how long* may we expect it to work so? No longer, we fear, than numbers of the same ingenious class of novelties which have gone before it—to oblivion.

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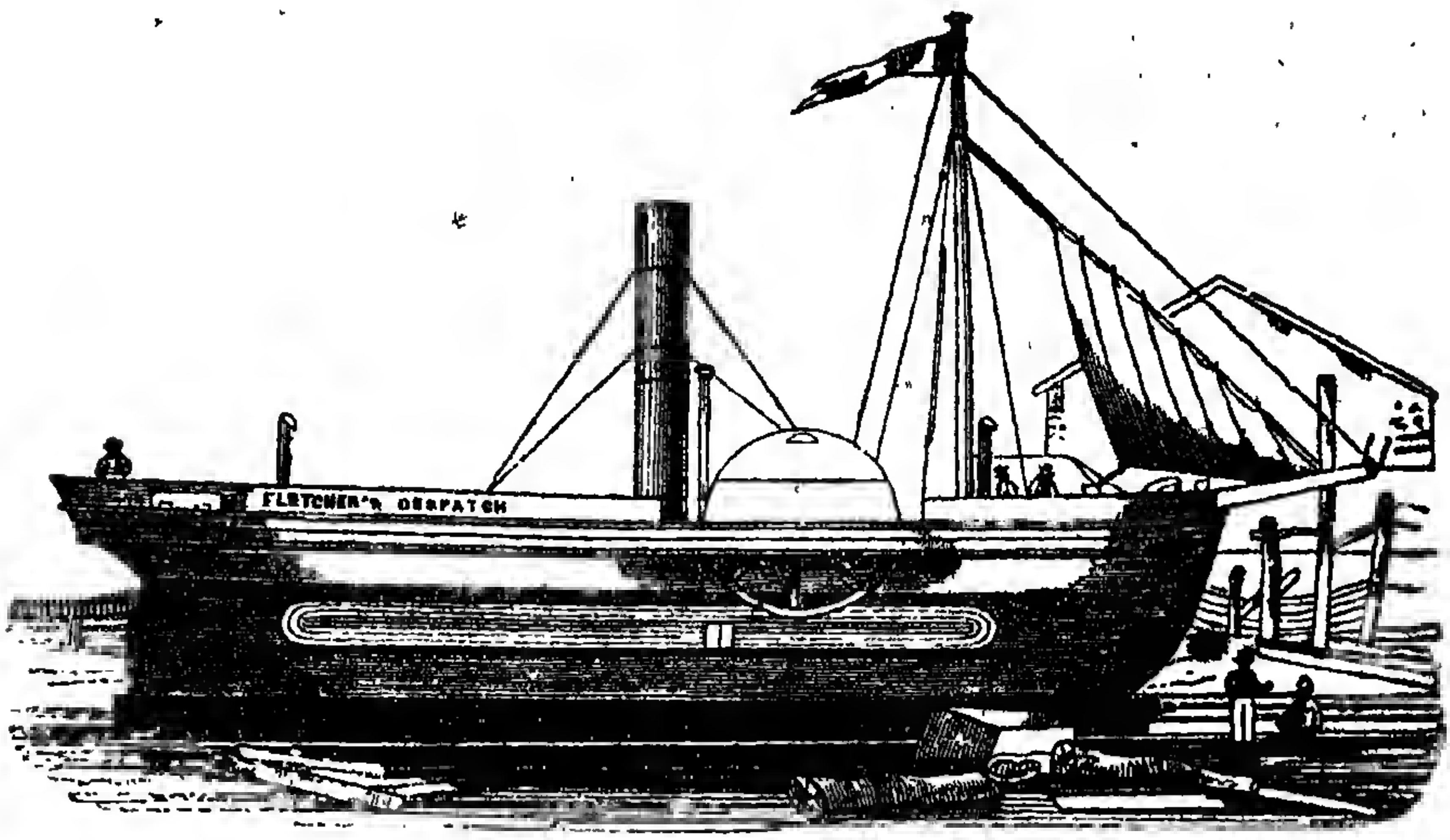
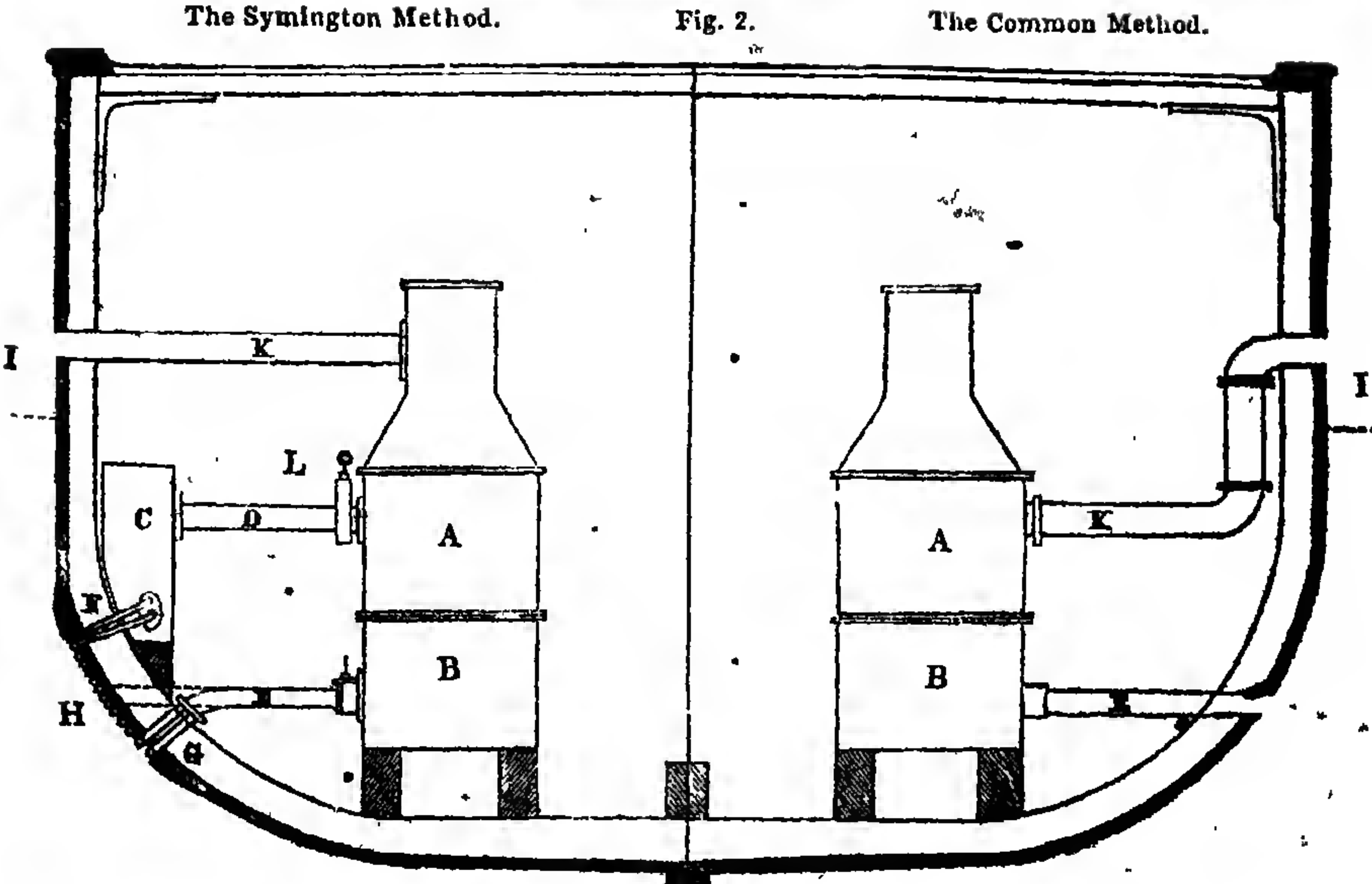
THE "DESPATCH," OF HULL, WITH SYMINGTON'S METHOD OF CONDENSATION.

Fig. 1.



The Symington Method. Fig. 2. The Common Method.



THE SYMINGTON METHOD OF CONDENSATION, AS APPLIED TO THE STEAM-VESSEL "FLETCHER'S DESPATCH," OF HULL.

Sir,—Were I not well aware that the most valuable and simple inventions are generally the most difficult of introduction, I might long ago have despaired of the general adoption of the Symington Method of Condensation, an invention which, I feel fully assured, will yet prove highly important to steam navigation. Of its successful application, *for a period of more than two years and a half*, to the *Fletcher's Despatch*, of Hull, some notice has been already, more than once, taken in the *Mechanics' Magazine*; and as no stronger evidence than this case affords can, probably, be adduced of the sterling merits of the invention, and need not, indeed, be required, I am induced to solicit a place in your pages for the following additional particulars, and for the illustrative engravings which accompany them.

It is now approaching to three years since the Symington Condensing Apparatus was fitted to the *Despatch*, whose worthy and spirited proprietor has repeatedly borne testimony to the advantage he has derived from it. In letters lately received from him he says, "I am so highly satisfied with your system of condensation, that I would do any thing in my power to assist you; for I do think, were it universally adopted, it would prove a great public benefit." Again: "With regard to the quantity of tallow used, I beg leave to say, that just one-half is used, when working the new, less than what was used on the old plan." And further: "The Captain says, the saving of fuel is immense, and he hopes never again to use the old plan; for the foamentation was tremendous, and they had often to stop the engine, it being impossible, at times, to get steam; while, with the new plan, steam is abundant, and wasting." Mr. Fletcher says, in conclusion: "I am perfectly satisfied, and so will any person who tries it."

Fig. 1 of the accompanying engravings is a perspective view of the *Despatch*, showing how far its external appearance is affected by the addition of the Symington apparatus. Fig. 2 is a transverse section of the hull, showing on one side a condensing apparatus on the ordinary plan, and on the other the (slight) additions necessary to be made to obtain all the advantages of the new system.

A Hot-well.

B Condenser.

C Tank to receive the water from the hot-well.

D Pipe to convey the water from the hot-well to the tank.

E Injection-pipe.

F Pipes to convey the water from the tank to the refrigerating pipes.

G Pipes to convey the water from the refrigerating pipes to the condenser.

H Refrigerating pipes.

I Water line.

K Discharge pipe.

L Valve to shut off the connexion to the tank.

It was but a few weeks ago that I learned, to my surprise, that several practical gentlemen entertained the belief that the plan was for the purpose merely of condensing steam, since it is for the purpose of cooling the hot water now thrown overboard, formed by the blending together of the steam and injection water in the common condenser, an error which the accompanying engravings, if you favour them with a place in your Journal, cannot fail to remove.

With best thanks for the favourable opinions you have given of the invention,

I remain, Sir,

Your most obedient servant,

ROBERT BOWIE.

Burr-street, Feb. 25, 1842.

ON THE IMPROVEMENT OF BOILERS.

BY C. W. WILLIAMS, ESQ.

Sir,—The following explanation of the circumstances which led me to take the prominent part I have done in enquiring into the causes of the defects of steam-boilers may not be without its interest to your readers, and will, I trust, justify me in occupying so much of your columns with plans for their improvement. They will also be a sufficient answer to the assertion that "engineers and boiler-makers know their business too well to lack instruction from a pack of effervescent chemists and druggists;" meaning those chemical authorities of high standing, whose opinions I have cited in confirmation of the chemical views on which I relied.

Being much interested in the improvement of steam-vessels, from my connexion with steam navigation companies,

and having had a longer and more extended experience in the details of their building and equipping than, perhaps, any individual director of a steam company in the kingdom, my attention has been uninterruptedly given to the subject since the year 1823, when I first established a steam company, and undertook to have the first steam-vessel constructed capable of maintaining a commercial intercourse across the Irish Channel, during the *winter* months; and which, till then, had been considered impracticable.

Since that time, my object has been the imparting, through the instrumentality of the most experienced ship-builders and steam-engine manufacturers, the greatest practicable degree of perfection and efficiency to every part of the hulls and machinery of steam-vessels.

With respect to the improved state to which the *hulls* of steam-vessels have been brought, I refer to the papers and detailed specifications for the building of the last of those belonging to the City of Dublin Steam Company, as furnished by myself and Mr. J. C. Shaw, the Marine Manager of that Company, to the Commissioners of Steam-vessels Inquiry, Josiah Parkes, Esq., Civil-engineer, and Captain Pringle, and printed in the Appendix to their Report.

For a practical illustration of the perfection to which both *hulls* and *machinery* have been brought, I refer to the steam-ship *Oriental*, one of those now under contract with her Majesty's Government for conveying the East India mails between Great Britain and Alexandria.

The result of this long experience is the finding, that, notwithstanding the improved state to which the construction and appointments of the hull and general machinery of steam-vessels have arrived, great uncertainty and risk of failure still prevail in the department of the *boiler*, and all that belongs to *the use of fuel* and *the generation of steam.*

Much, certainly, has been done towards imparting strength to the boiler and lessening the risk of explosion.

The most experienced engineers are, however, still unable to decide, *previously to trial*, either as to the quantity of fuel that will be consumed or of steam generated.

It is true, the engineer, who undertakes the construction of the engines, also undertakes that the boilers shall provide a sufficiency of steam to work them; but what that *sufficiency* means, has not been decided; and, in too many instances, the absence of some fixed data on the subject has led to complaints and references, which, though they may end the disputes between the owners and makers of the engines, leave the evils of a deficiency of steam or a great expenditure of fuel unabated.

If there happen to be "*steam enough*," the engineer's triumph is complete; although it is seldom that an account is taken of the quantity of fuel consumed, or whether it be attended with economy or waste. If with economy, the merit of the engineer is enhanced; but, if with waste, the sufferers, having no redress, keep their grievances to themselves, and the ledger account of fuel consumed, is the only index to the cause of that absence of profit which is the usual result.

Under the conviction of the danger of taking responsibility from the engineer, although alive to the prevailing uncertainty and risk, I felt, in common with other directors of steam companies, an unwillingness to interfere. From being so deeply interested in the improvement of this department of steam navigation, I have watched, with no small anxiety, the efforts of the engineers to arrive at some degree of certainty in what was admitted, on all hands, to be the most serious drawback to the application of steam vessels to long sea voyages. I perceived the absence of any intelligible or well-founded principle in the construction of the boiler;—that the part on which most depended, appeared least understood, and least attended to, namely, the *furnace;* and that this was too often left to the skill (or want of it) of working boiler-makers or bricklayers. I saw that, although the great operations of combustion which are carried on in the furnace, with all that belongs to the introduction and employment of atmospheric air, were among the most difficult processes within the range of chemistry, the absence of sound scientific principles still continued to prevail; yet on these depend the extent or perfection of the combustion in our furnaces.

Years were still passing away, and, while every other department was fast approaching to perfection, all that belonged to the combustion of fuel—the

production of smoke—and the wear and tear of the furnace part of the boiler, remained in the same *status quo* of uncertainty and insufficiency; and, although the recourse to new plans and new smoke-burning expedients continued, and every year brought fourth a new batch of infallible remedies for "consuming smoke and economizing fuel," success and certainty seemed as unattainable as ever, although there appeared such an abundance of labourers in the field of speculation and invention.

In fact, things seemed almost retrograding into greater doubt and want of system, rather than advancing to perfection, or even keeping pace with the improvements of the hulls and engines; and many of the furnaces, both of marine and land boilers, constructed within the last few years, with their arrangements for effecting a perfect or economical use of fuel, exhibit greater violations of chemical truths, and a greater departure from the principles on which nature proceeds, than any preceding ones which have come under my observation.

With respect to the all-important considerations, the quantity of fuel required, or the most judicious mode of effecting its combustion, the problem,—whether the boiler (for the furnace is never spoken of apart from the boiler) would generate more or less steam—produce more or less smoke—or consume more or less fuel—still remained to be decided by the *argumentum ad rem*, alone—*experiment;* and, if unsuccessful, the evil would be irremediable, and the owners doomed to eat the bread of disappointment, if not of loss. The result of a boiler, on being tried, turning up a trump, and giving "plenty of steam," with a small consumption of fuel, was, indeed, tantamount to a profitable employment of the vessel, while the reverse was inevitably attended with a succession of alterations, and, most likely, of loss to the speculation.

These were the considerations which operated with me when adding my mite to the inquiry, an inquiry which, it is manifest, will not be originated by the "working boiler-maker or bricklayer;" and, if I have not perfected the system which so loudly calls for improvement, I have, at least, directed the inquirer into the right road.

On my own part, the reluctance to interfere and share the risk of failure was put an end to by an *imperious necessity.* I was brought to the conclusion, that, to remain any longer a mere spectator of those abortive efforts towards improvement, and, in all cases, to wait the result of *trial*, before it could be ascertained whether a new boiler was to turn out good or bad, wasteful or economic, was inconsistent, if not with the progress of steam navigation, at least with the most vital interests of those for whom I was acting.

This *ultima ratio* for interference, *necessity*, became also the more urgent, since long sea voyages have been contemplated. The determination to examine for myself and exercise my own judgment was forced upon me by the failure of the steam-ship the *Liverpool*, on her first voyage to New York. I saw, that the owners and managers of steam companies could be in no worse position (as to risk or responsibility, touching the boiler department) from their interference, than that in which they were placed under the circumstances of non-interference.

The errors which led to the failure of the first voyage of the *Liverpool* were erroneously attributed to the interference of the managers or directors, and many unfounded reports were circulated. The failure was first attributed to "an expensive trying of experiments." Again, to an attempt "to try the celebrated Cornish principle of *slow* combustion, in order to burn the smoke." Again, and by the same party, to a system of "*excessive firing*," and "*over firing*," (the very reverse of the Cornish principle). It is only necessary to state, that no interference with the engineers, and no experiment of any kind, was made or attempted; on the contrary, a rigid determination prevailed against interfering with the makers of the boilers; and in fact, no injury or accident did occur to the boilers, much less occasion her putting back to Cork.

Among the proofs of this stationary or retrograding system I shall adduce the boilers originally placed in the *Liverpool.* I shall give the details of those boilers, and the several efforts, on the part of the engineers, to remedy what I will show were inherent defects, and instances of contempt for those chemical principles on which combustion and the right use

of fuel alone depend. I will show, that the cause of that wasteful expenditure of coals which marked the first voyage of the *Liverpool* was induced by the original mal-construction of the boilers, with their twenty furnaces—and by the injudicious mode of placing them in the vessel, with the facility thus afforded to mismanagement in their working; and that the latter, combined with the absence of sound judgment, in this instance, on the part of those in command, and an unnecessary and wasteful expenditure of fuel, in the teeth of written instructions, at a time when common sense would have suggested its being economised and reserved, were the direct causes of the failure which attended the first attempt of that vessel to cross the Atlantic. I will, from these facts, show, that, however well judged and considerate may be the plans of the directors of steam companies, however spirited may be their efforts to have every thing as perfect and efficient as money or determination can make it, yet still the comparative efficiency of a steam-vessel—the satisfaction and patronage of the public—and the general success of the speculation—must mainly depend on the manner in which the engineer performs his part.

I am, Sir, yours, &c.

C. W. WILLIAMS.

THE GRAINER'S GUIDE, BY CHARLES MOXON, LONDON.

A folio volume, under this title, has just appeared, which is eminently qualified to supply a desideratum which has long been felt by a very large class of practical ornamental painters, and is well calculated to correct the false taste which has too largely characterized most of our imitations of woods and marbles. In his introductory remarks Mr. Moxon observes, that "imitation of woods and marbles having now become a very fashionable style of decoration, and being so well adapted to the character of our buildings, it has long been a matter of surprise to me that no one has hitherto attempted, (at least with any considerable degree of success,) to lessen the difficulties that house-painters have to contend with in learning to imitate woods and marbles in a skilful manner. There has been no lack of works on the other and older branches of ornamental painting, for almost every month produces something new, although less useful to painters in general, in consequence of the prevailing taste of the public. Where there is one person employed in the other branches of ornamental painting, there are hundreds employed in imitating woods and marbles, and no doubt many more would be employed if the art were better understood. It is at once a recommendation to permanent and lucrative situations, to be able to grain in the most modern and improved manner. Therefore, as this knowledge of graining is of so much importance to those who are learning the art of house-painting, I trust that I shall not be thought presumptuous in endeavouring, after a practical experience, in London and Edinburgh, of seventeen years, to place within the reach of all, what that experience induces me to believe to be the right principles of working."

Mr. Moxon then proceeds to give some general directions to be observed in imitating woods, of a most pertinent and practical character, with particular instructions for the production of mahogany, maple-wood, rose-wood, satin-wood, wainscoat, &c.; these being followed by beautifully-executed specimens of each. The author remarks, that "the chief object in view is to instruct those who are desirous of becoming good grainers, by placing before them specimens executed by hand-brush in the most simple and practical manner; indeed, so much simplified, that any painter of ordinary capacity may, (by application,) in the course of a few weeks' practice, be astonished at his own advancement. More elaborate or more highly-finished specimens would, no doubt, be more captivating to the inexperienced; but those who understand any thing about graining will at once perceive the advantage to be derived from copying these simple patterns."

In his general remarks on imitating marbles, Mr. Moxon observes, that "the reason why marbles are more difficult to imitate than woods is, that few people possess a good eye for colour. I have seen some of the very finest wood-grainers commence to imitate Sienna marble with a handful of small pencils, and more fine colours than Rubens would have required

for the painted ceiling at Whitehall. Now, all that is required for this useful imitation is black and red; for with these two colours, and the ground, which is yellow, may be produced a thousand different tints." Particular instructions for imitating the marbles most in request, with a beautiful specimen of each, are then given. These are followed by some highly useful observations on preparing grounds, and polishing, which, did our space permit, we would willingly have transferred to our pages.

The whole plan and execution of the work is highly creditable to the artistical skill of Mr. Moxon, who, in thus laying before his brethren of the trade, (or, as the grainers say, the profession,) correct models for their study and imitation, has done much to promote a taste for simplicity and chastity of design, which, being founded in truth, never fails to realize more or less of the perfection of beauty.

ON REMOVING THE HEATING EFFECT FROM THE SOLAR AND OXY-HYDROGEN MICROSCOPES.

Sir,—I have read lately, in the *Philosophical Magazine*, vol. x. p. 184, a description of a method of cooling, by a current of air, the heating effect on the objects exhibited in the solar and oxy-hydrogen microscopes. The object is stated to have been accomplished by the use of a pair of domestic hand-bellows, and with complete success, the thermometer indicating the temperature to be as low as 60° Fahr.; so that, to quote the words of the writer, "our solar and oxy-hydrogen microscopes, instead of being used for purposes of amusement only, and limited to the exhibition of objects which are unaffected by heat, may henceforward be employed for purposes of scientific investigation, and thereby assume the more important rank of valuable philosophical instruments." In furtherance of these views, I beg to propose the use of a revolving disc of glass, the lower half of which ought, probably, to be immersed in a trough of water, the upper portion passing over the objects in a space between them and the condensing lenses. Not having an instrument of the class by me, I have not had an opportunity of testing the value of this suggestion; yet there are, no doubt, some of your readers in possession of one, and if they will do so for me, I shall be very happy to hear the result. The glass disc may be made like the plate of an electrical machine, and may be conveniently set in motion by a lowering weight.

I am, Sir, yours, &c.,

S. M. Newsam.

CONDENSATION OF STEAM BY COLD AIR. CRADDOCK'S PROCESS.

Sir,—With your permission I will lay before your readers an account of my patent condenser for steam-engines, and of a series of experiments made therewith; the latter of which will, I trust, demonstrate that the condensation of steam by the cooling effect of air, hitherto considered impracticable, is not only within the reach of possibility, but can be effected with such facility as to render its adoption general in those situations where a supply of water is not to be procured.

The peculiar feature of my invention is, the communication of a rapid motion to the condenser; independent, of course, of the motion which the vessel or locomotive may have, to which my condenser is attached. It will be unnecessary for me to detail my preliminary experiments, or the various forms which I have given to the condenser during my investigations: I will therefore at once describe the apparatus in that form which, from my present experience, seems to me the best. A hollow axis is supported by proper bearings in a vertical position. The lower end, or that at which the steam is introduced, is open, and works on a pivot fixed on the bottom of a chamber, on the top of which is a stuffing-box, through which the axis passes. Near the upper or closed end of the axis is an enlargement or chamber, from which proceed, at right angles to the axis, a number of radial hollow arms, into each of which the ends of a series of small copper tubes are inserted; these, of course, are parallel to the axis; their lower ends are inserted into other radial arms fixed near the bottom of the axis, and similar to those at top, excepting that their ends do not open into it. The radial arms at the bottom are all connected by their ends opening into an annular chamber. A

rapid rotary motion is given to the condenser by the steam-engine to which it is attached, the result of which is the cooling of the apparatus, and, consequently, the condensation of the steam which has been introduced into the small copper tubes. The condensed steam or water falls into the lower radial arms, and is thrown from thence into the annular chamber by centrifugal force; a small pump is affixed to this chamber, and its piston-rod is attached to the clip of a fixed eccentric supported round the movable axis of the condenser. As the pump travels about this eccentric, its piston-rod works to and fro, and the water is removed from the condenser. The arrangement of the minor parts of the apparatus, such as the conveyance of the water to the boiler, the connexion of the air-pump, &c., cannot be illustrated without drawings. I may just remark, here, that the force-pump for the removal of the water is not absolutely necessary, as the air-pump may be made to effect that object. My experience, however, demonstrates that it is effected to greater advantage by its use.

I have attached a condenser of this kind to a high-pressure engine of five horses' power, and, by giving it a velocity of 11 miles per hour, the water is drawn off at a temperature varying, with that of the air, from 90° to 120° Fahr. The column of mercury supported by the vacuum is not quite so high as it should be, according to the temperature of the water; this, however, is owing to the imperfection of some of the joints in the condenser, and will soon be remedied. The power gained is more than double that required to work the condenser and air-pump. The amount of surface required to condense a given number of cubic feet of water per hour depends on the velocity at which it is intended to work the condenser, and the temperature at which the water is drawn off. It does not appear to me advisable to draw the water off at a temperature lower than 150°, for a given abstraction of heat at a lower temperature affects the height of the mercurial column much less than at a higher; and any one familiar with the law according to which heat passes from one body to another need not be told, that the same surface will condense much more steam into water at 150° than at 100°. A condenser having a velocity equal to 20 miles per hour, and the water being drawn off at 150°, will require about 20 square feet of surface per cubic foot of water per hour. The strength of the copper I have hitherto used is 1 lb. to the square foot, but I intend using it much lighter in future. The weight of a condenser equal to condense 10 cubic feet of water per hour will be from 8 to 10 cwt.

Besides the advantages which my mode of condensation possesses, in those situations where a supply of water cannot be had, I believe it possesses other, and scarcely less important ones. By my condenser returning the water to the boiler, I am enabled to use a tubular boiler, without experiencing that inconvenience which almost precludes their use in combination with the ordinary system of condensation, namely, the liability to become choked up by the deposit from the water. Although the condenser with which I am working is far from being tight in its various joinings, I have worked my engines constantly, for four days, without adding any water to the boiler; and I have no doubt that the condenser and engine I am now fitting up, and to which I hope very soon to be able to call the attention of engineers, will give results even more satisfactory than those at present obtained.

In conclusion, I have only to remark, that the apparatus and engine with which the above results were obtained may be inspected by any parties who feel interested in the matter, at my manufactory, 350, Coventry-road, Birmingham.

I am, Sir, &c.,

THOMAS CRADDOCK.

NEW AND SIMPLE METHOD OF OBTAINING MEZZOTINT GROUNDS.

Sir,—It gives me some pleasure to be able to announce that I can form a tolerably good mezzotint "ground" on a plate, by passing it along with a piece of common sand paper five or six times through the rolling printing press, with rather a tight pressure. The depth of colour, when printed from, does not quite possess the intensity of those executed in the usual manner; but the method answers exceedingly well for prints which are intended to finish in colours.

Sir, I remain your obedient servant,

LAURENCE BRUNTON.

March 14, 1842.

IMPROVEMENT IN LATHES

Fig. 1.

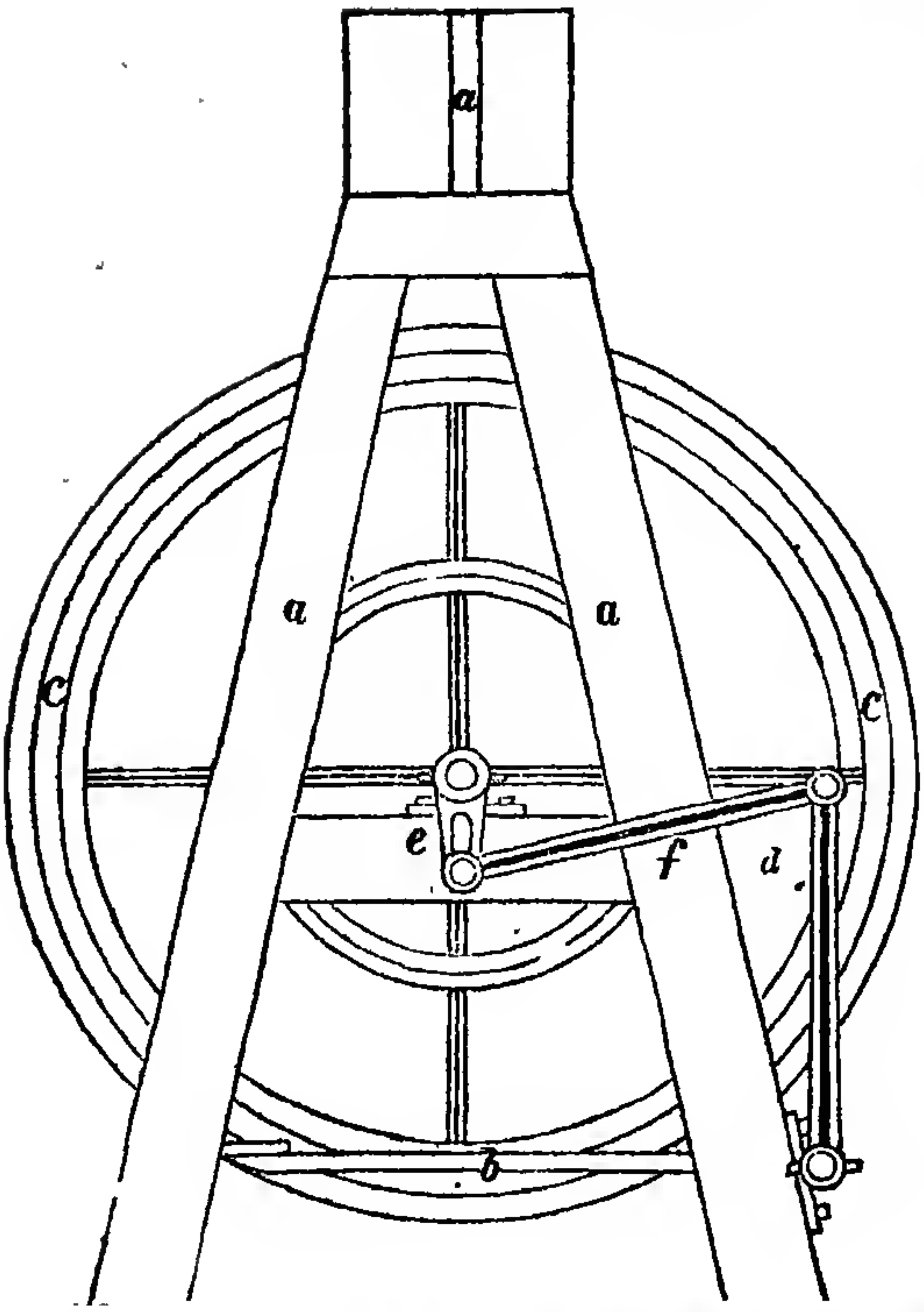
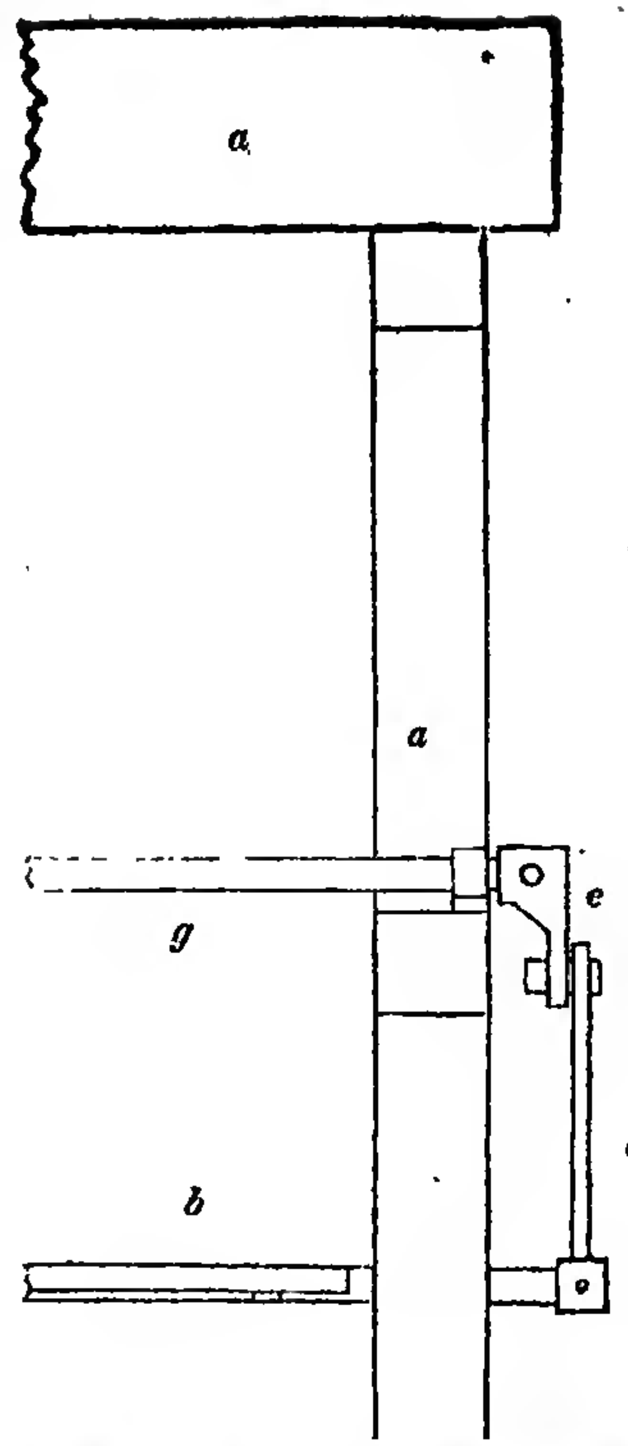


Fig. 2.



Sir,—The prefixed sketches represent an improvement in the lathe, which I believe to be original, and have found to add greatly to the ability of this valuable instrument. The figures are on the scale of an inch to the foot.

I am, Sir, your obedient servant,

H. Childs.

Laughton, February 24, 1842.

Description.

Fig. 1 is an end view of the lathe bed; and fig. 2, part of an elevation of the same, with the front leg removed. *a a a a a*, represent the lathe bed; *c c* the wheel; *b b* the treadle, firmly fixed to the back bar *g*, which turns in brass bearings, fixed to the legs of the lathe as shown, and to the end of which is fixed the upright rod *d*, communicating with the crank *e*, by the connecting rod *f*.

It will be seen, on reference to fig. 1, that the crank *e* (which is fixed to the shaft *g*, at the driving wheel,) has a groove in the middle of it, which allows the pin, to which the connecting rod *f* comes, to be shifted to or from the centre and made fast at any required distance, as the case may require, by a nut and screw at the back.

H. C.

APPLICATION OF THE ELECTROTYPE TO THE MULTIPLICATION OF GRADUATED INSTRUMENTS.

Sir,—In your last Number, which has just been received, I observe mention made of a new application of the electrotype, by M. Peyré, for multiplication of graduated instruments. As the first to make the subject public, doubtless he has a right to the invention. The method was, however, proposed by me in December, 1840, "for producing graduated astronomical instruments from an original

one; also scales, dials, &c.; and probably for producing plates of marking in insects' wings, &c., for printing from." The plan was tried by me, but only to a limited extent, for the production of scales; the result of one experiment being an electrotype scale, divided into 100 of inches. A variety of circumstances prevented me from paying immediate attention to the matter, or I should have communicated the results to you. The plan of M. Peyré will, I have little doubt, be of value, and the public will be indebted to him for making them acquainted with the further success of his process. It has occurred to me, also, that the electrotype process might be successfully used for producing tools for re-grinding or polishing specula, as the tool might thus be made from the speculum itself, if of good figure; and any number could be made from the original tool, as those in use altered in figure. Tools might also be made from *lenses*, for the same purpose. If you think these hints likely to be of service, perhaps you will insert them in the *Mech. Mag.*, and oblige,

Sir, yours respectfully,

N. S. Heineken.

Sidmouth, March 18, 1842.

"DOUBLE ACTING ROTARY ENGINE COMPANY."

We learn from some papers which have been forwarded to us that a project is on foot for the formation of a company under the above title, for bringing into use a "new motive power," which is considered to be incomparably superior to steam, and therefore infallibly destined to supersede it every where and for every purpose. "Mighty agent" as steam is, this is represented to be mightier still. To the application of steam there are certain practical limits, but this new power is a power which "can be carried *to any extent*." The cost, too, is not simply less than that of steam—it is "*infinitely* less." People may send their present steam engines to the marine-store shops, and obtain as much for them at old metal prices, as will suffice to build them "infinitely" better engines on this new power plan. "The sale of the rejected metallic parts" is to defray "nearly" all expenses of every kind, both present and future. For, once erected, an engine on this new plan is to cost nothing, or next to nothing; "no fuel, of any kind is required"—no "daily maintenance"—it is to work without any "wear and tear," saving only the "mere loss occasioned by friction"—all that is wanted absolutely is, but a little oil or tallow to lubricate the parts occasionally—once a twelvemonth or so! Some of our readers (we hope *not many*, however) may by this time have pictured to themselves that "galvanism, or electricity" must needs have something to do with this new miracle of invention. No such thing—the mystery lies a good deal deeper. Neither galvanism nor electricity is of virtue enough for the accomplishment of such wonders; and "for this simple reason," says Messieurs the projectors of the "Double Acting Rotary Company," "*that they are convulsions of nature never intended by a Divine Providence for the use of man*"!!

Where then lies the grand secret? In a narrower compass than any thing so extraordinary was ever perhaps shrouded before—in a nut shell verily. You have but to place an empty cylinder, one half in water, or any other fluid, and one half in a vacuo—*that is, literally, all you are required to do*—and you shall cause it to revolve continually, and with any degree of power you please—remembering only to make your cylinder large enough! And for this other "simple reason:" there are "two tendencies to move" in the cylinder—the tendency of the part in water to rise, and the tendency of the part in vacuo to fall, and "the two tendencies being auxiliary to each *other*, *necessarily produce a continually revolving motion*!!!"

The thing is so like a *joke*, that it may be difficult to persuade our readers we are not joking. We describe the invention, however, with strict fidelity, as we find it described in the printed papers of the projected Company now before us. The inventor and his friends then must have deceived themselves? One would in charity think so; but if they have, it is not at least without sufficient pretence of ability to judge rightly, and without a great display of pains to go on sure grounds. The inventor is a "Count de Predaval," "who styles himself *Engineer* in the Service of his Imperial Majesty the Emperor of Austria;" and the Count, as a good and respectable engineer worthy of such distinguished patronage would do, has been careful not to submit his inven-

tion to the public till "after the *strictest experimental investigation has perfectly proved its merits.*" Nay more, "with a view to obtain the corroborative evidence of scientific men on his invention, *it was submitted to several eminent engineers;*" and a report of "*one of them*" is given at length, which we are told "*vouches for the excellence and applicability of the principle of the invention,*" as in sooth it does. Who the other "eminent engineers" were, and what they said of it we are not told. The Count, probably, thought that after "one of them," and he, no doubt, the most eminent of the lot, had said his say to such capital purpose, there was no need of further testimony. Would any one, after quoting a Wellington on a point of military skill, think of calling to witness either a Colonel Toby or Corporal Trim? But who is this selected "one"—the most eminent among the eminent—the Count de Predaval's Wellington of engineers? The Report is signed "Edward Lomax," and dated from "2, Queen-square, St. James's-park." We must candidly own that we never heard of the name of "Edward Lomax" before, far less of the engineering eminence attached to it. We live out of the world, however—the Count de Predaval in it, (not without some dark intent, we fear, to make of it "his oyster;") and the Count de Predaval says "Mr. Edward Lomax, of 2, Queen-square, St. James's-park," is an "engineer," and an "eminent" one, too; and the Count de Predaval is himself an "engineer," and "in the service of His Imperial Majesty the Emperor of Austria," &c. &c. &c.

Do not all these things, then, satisfy us? We must in sober seriousness say, they do not. We have no respect for "experimental investigations" which prove impossibilities—things which could never have been proved; and must doubt the mechanical knowledge and ability—if we may not the titles and the "eminence"—of those who "vouch" for them. We protest that we never, in all our experience, met with any thing more ridiculous than the pretensions contained in this "Prospectus" of the Count de Predaval; nor any thing more elaborately absurd than the "corroborative" Report of his friend, the Wellington of engineers, "Edward Lomax." The scheme is a veritable perpetual motion, and one of the most—if not literally *the* most—nonsensical and visionary of its class.

It may be asked, why, if it be so foolish a thing, we put ourselves to the trouble of this public exposure of it? We will tell our readers why. Had the scheme been left to depend on its own merits, or even on the authority of Mr. Edward Lomax—"eminent" as that individual may be—for acceptance with the public, we should not have thought of saying a word about it, feeling, as we should have done, well assured, that it could dupe nobody. But at the head of the "Prospectus" there are the names of a number of persons paraded, as constituting a "Provisional Committee" for the management of this projected "Double-acting Rotary Engine Company;" and among these there is one name which, if it were placed there with the consent of the owner, would of itself command for the plan the confidence and contributions of thousands. It is the name of one of our most learned Professors—of a gentleman of real and deserved eminence for his scientific acquirements, and scarcely more distinguished for academic lore than for practical wisdom, strength of judgment, and keenness of discrimination. Who, knowing any thing of Professor de Morgan, would think of asking whether it was a piece of moonshine or humbug to which he had given the sanction of his name? Or who, with money to spare, would hesitate much about paying down a few pounds to be one of "the first hundred" to share with the worthy Professor in the golden harvest of which M. the Count de Predaval offers to make them partakers, and in the "liberal premium" which the said "first hundred" are to have into the bargain, for benefiting themselves? Here it is the danger lies: here our reason for bidding all and sundry—beware! We have the authority of Professor de Morgan himself for stating that he never heard of this "Double-acting Rotary Engine Company," till he saw his name at the head of the Prospectus; that he knows nothing whatever of the scheme, or of its inventor, or of any of his associates; and that he utterly repudiates all connexion with them and it. We think our readers will agree with us, that this looks like something more than being self-deceived. People do not commonly use the names of other people, without their knowledge or authority, for any other purpose than that of wilfully deceiving others.

Neither are sham Provisional Committees and sham Boards of Directors such novelties in the annals of public delusion, as to make it at all unlikely that something of the sort may be in course of perpetration here. We do but our duty, at all events, in making public what we know of the case; since every share of patronage extended to bubble schemes is not only, so much diverted from the encouragement of legitimate ingenuity and enterprise, but has a tendency to produce an indiscriminate prejudice against all new inventions, to the grievous injury of many of solid worth and unquestionable public utility.

CEMENT FOR SILK— HYDROSTATIC PRESSURE ON THE VELOCIPEDE.

Sir,—In reply to the question of your correspondent relative to a cement for silk, allow me to give you the result of a successful experiment I have recently made. Having an old *silk* umbrella much rent and worn, and for which there absolutely seemed no sufficient cure but that of a new cover, I caused a number of odd pieces of silk to be cut into ornamental shapes for covering the various rents, and having procured a small quantity of caoutchouc, in the liquid state, as sold by retail, (I got it at a shop near the S.E. corner of Leicester-square,) I spread with the finger upon each piece a thin layer of the cement, as well as upon the corresponding pieces, at the *inside* of the open umbrella; when dry I added a second and a third coating, after which the patches were applied to their respective places, and found to adhere very firmly. I have had the umbrella in use for some months, and find it absolutely impervious to rain—in fact better than when purchased new; and from the plan adopted in systematically shaping the patches, the effect is rather favourable than otherwise.

I avail myself of this opportunity to suggest to your correspondent of Feb. 26, that if at the end of the lever of his velocipede he could contrive to inclose one or more columns of water, so as to bring to bear the principle of hydrostatic pressure, I think he might prodigiously assist his power of locomotion. The astonishing effect of this principle may be estimated from the Bramah press; and although, as a general rule, what is gained in power is said to be lost in time, it appears to me that the objection may be obviated.

I remain, Sir, &c.,

R. H.

Highgate, March 10, 1842.

CASES IN SCREW POWER.

1. Suppose two screws made of metal of the same quality, and passing through nuts of the same thickness, but the threads differing in inclination, and consequently thinner in one than in the other, be opposed in their passage through the nuts by an equal amount of resistance—is the thread of one more likely to break than that of the other? If so, why? since, both being half thread and half space between, there will be the same quantity of metal to bear the resisting force.

2. If a screw with a considerable space between the coils of its thread, produce a certain pressure, with a certain force applied to turn it, will a greater pressure be produced with the same force, if one thread or more having the same inclination as the first thread, be inserted between its coils?

William Spurrell.

Carmarthen, Feb. 19. 1842.

WHICH OF THE COMMON WOODS ARE LEAST LIABLE TO WARP?

Sir,—If any of your correspondents can inform me which of the common woods, in boards, stand best without shrinking, swelling, or warping, in an atmosphere sometimes dry, sometimes replete with moisture, and at a temperature varying from 100° to 150° Fahr., I shall be greatly obliged by the communication. I do not apologise for this request, conceiving it to be one of general interest to mechanics. If the answer should be found among the deals or pines, it will be necessary to state the kind. Would kyanising, or any other process, be of advantage?

I am, Sir,

Your humble servant,

Quilibet.

SUGGESTION FOR THE IMPROVEMENT OF MR. PILBROW'S ENGINE.

Sir,—Permit me to offer the following suggestion with regard to Mr. Pilbrow's engine: it is, that a pipe should be added to connect the upper and lower eduction ways, so that supposing the steam-piston to have completed its down-stroke, the steam may be allowed to flow into the top of the condenser, *without* giving injection, until the pistons are about half-stroke, when the top valve being closed, the remainder of the steam may be made to pass through the pipe into the lower part of the condenser, and condensed immediately. By these means there would be, for half the stroke, a vacuum in the top of the steam-cylinder, and during the whole

stroke, in the bottom of the condensing cylinder, and a certain amount of pressure in the top of the condensing cylinder. Of course the valves would be reversed at the opposite part of the stroke. It is unnecessary to enter into the arrangement of the valves required by this plan, the least complex being generally the best.

I am, Sir,

Your obedient servant,

THROTTLE-VALVE.

MECHANICAL CHIMNEY SWEEPING.

Sir,—I regret to say indisposition has prevented me from answering Mr. Baddeley's communication in your Journal of the 26th ult., under the head of "Mechanical Chimney Sweeping."

As I had no object, beyond that prompted by humanity, in bringing my plan for Mechanical Chimney Sweeping before the public, and as I have stated a sufficiency on the subject, and having no particular argument of Mr. Baddeley's to refute, I shall beg permission to leave the discussion at this point, feeling assured, that to occupy your valuable columns further therewith, would neither be interesting nor instructive to your readers.

I am, Sir, respectfully yours,

JAMES A. EMSLIE.

Newcastle-upon-Tyne, March 18, 1842.

PREVENTION OF RAILWAY ACCIDENTS.

Sir,—In your valuable Miscellany, Part 228, is an article under the title of the "Modern Mechanical Moloch," in which you dilate in strong and deserved terms upon the carelessness and supineness of railway companies respecting the safety of the lives of passengers, and the evident want of means to remedy this dreadful evil. From perusing the above, and from other causes, I have thought much upon the subject, especially as relates to the frightful consequences of concussions, and I feel convinced, that by a proper application of mechanical power these evils may be removed. I have devised a plan for this purpose, and constructed a working model which answers my most sanguine expectations; the principles of which are an improved buffer apparatus, by which a motion of two yards may be obtained; and in connexion therewith a self-acting break, on a very simple principle, both of which can be applied at a very trifling cost.

Not being in a position to give to the [illegible] the fruits of my labour by a further [illegible] of my plan, my object in now [illegible] you is, with your permission, to make the circumstance known, through your valuable Periodical, to those interested in railway affairs; and if any of your readers should think proper to communicate with me upon the subject, I shall be happy to afford them every information.

I remain, Sir, your obedient servant,

OLIVER MOORE.

Sneuton, near Nottingham.

P. S. I have also an entirely new and superior plan of a terminus buffer.

NEWEST CLYDE STEAMERS.

Sir,—I observe in your last Number 971, page 240, a paragraph beginning thus:—"What do the champions of Thames supremacy in steam-boat building say now to Clyde-fitted steamers?" and a statement follows in reference to "the theoretical curve" which I (and I venture to say many other of your readers) do not understand. However, I must beg to be allowed to ask, What do the champions of Clyde-fitted steamers say to the fact, that the engines of these fine formed wave line vessels which glide so freely through the water, are consuming from 12 to 14 tons of coal every twenty-four hours more than the Thames-fitted steamers? It has been found that the consumption of the *Thames* during her run out and home, has averaged 26 tons per day of 24 hours, while the "Clyde" and "Solway" are not burning less than 40 tons in the same time. What will the advocates of Scotch engines say to this? Here we have engines of the same nominal power employed to propel vessels of the same tonnage, yet one pair costs 14*l. per day more* for coals than the other!

I would again strongly advise the Directors of the *Royal Mail* Steam Packet Company, to adopt the plan of a log-book, suggested by me in your 958th Number. Those interested in steam-navigation could then judge for themselves, and I am quite sure the London engineers would not object to the result being published.

In reference to your observations on the combined cylinder engine erected by Messrs. Rennie, at Mr. Thomas Cubitt's, Thames Bank, I learn that some extensive experiments are being made with this engine, in order to determine the quantity of water passing through it as steam, together with the consumption of fuel and work performed, the results of which I think I shall be able to lay before your readers.

I am, Sir,

Your obedient servant,

L. P.

March 23, 1842.

"THE ANTI-JOHN-SCOTT-RUSSELL," CHALLENGE TO THE WORLD.

Sir,—In your Number of the 19th instant, under the head of Notes and Notices, there is an article upon the "Anti-John-Scott-Russell" steam-boat, which is propelled by a rotary engine, the property of the inventor, Mr. J. T. Beale, which article, I must confess, has surprised me more than any other I ever read in your valuable work. I have the honour of being acquainted with Mr. Beale, and have travelled in his boat on very many occasions. And, as I have had considerable experience in steam-engines generally, I feel that I am better qualified to judge of the properties and power of the engine in that boat, than the writer of the article in question. Sir, I have so much confidence in its performance, that I hereby offer to the anonymous writer of the paragraph, to run the Anti-John-Scott-Russell (having obtained a promise of the use of her for the occasion) from Greenwich to Richmond, and back, against any steam-boat in the world for 20*l*. And, as I do consider the match, if made, would not be for the sake of the money on either side, I propose that the amount be given by the winner, for the benefit of the Dreadnought Seaman's Hospital. If, however, the writer of the article alluded to, should not feel sufficient confidence in the *non*-performance of Mr. Beale's engine to accept this challenge, I shall construe his silence into a retractation of his statement.

As I consider your publication to be intended for the benefit and protection of mechanical science, and not its injury, I trust you will give the above a place in your next Number. By so doing, you will confer a favour upon

Your very obedient servant,

JOHN BENINGFIELD.

28, Jewry-street, Aldgate,
March 22, 1842.

[We have also received a letter on this subject from Mr. E. Whitley Baker, who says, "I have been on board the boat in question on several occasions, and do not speak of her performances upon *five minutes'* assertions. On the Wednesday prior to the appearance of the article in your Publication, the boat left the five mile post (opposite Greenwich Hospital) and arrived at London Bridge Wharf against wind and tide in *thirty-three minutes*, stopping near the Tunnel a few minutes for the gratification of an engineer of eminence, and which was, of course, a loss of time, &c."]

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

RICHARD WHITAKER, OF CAMBRIDGE, MACHINIST, *for improvements in cutting the edges of books, and paper for other purposes; and in impressing ornaments, letters, and figures on the binding of books, and on other surfaces.* Enrolment Office, March 4, 1842.

The first improvement refers to the cutting-press. Instead of the sliding cheek being urged forward by two screws, as is usual, there is an endless screw lying horizontally opposite the middle of the cheek, which takes into two horizontal toothed wheels; these wheels take into two toothed racks, proceeding one from either end of the traversing cheek. On turning the handle, therefore, the cheek traverses backward or forward, according to the direction in which it is turned, being held tight when screwed up by a pall and ratchet. Instead of the common groove on the left-hand cheek, a dove-tailed groove is employed. The books or paper intended to be cut are placed upon a platform or table beneath the press, which is raised or lowered by means of a pinion acting in two racks, very similar to the arrangement submitted to the Society of Arts, in 1832, by Mr. Penny, and described at length in our 22nd volume.

The plough adapted to this cutting-press has a brass or other metal sole, with a dove-tailed projection which exactly corresponds with the dove-tailed groove before noticed, as applied to the cheek of the cutting-press. A diagonal stay is also introduced, to counteract the *springing* of the knife.

For lettering and ornamenting the backs of books, the following apparatus is employed. The letters, ornaments, &c., employed are those invented by Mr. Baddeley, which are set up like type, within a chase of a new construction, at the back of which there is a box for receiving a heater. The book being placed upon the platform or table, and the press screwed up tight, the chase containing the desired impress is attached to a long lever terminating in a handle; the short arm of the lever is attached to an upright bar, from the lower end of which a cord passes down under a pulley, and thence up to a larger pulley or wheel having several rims or speeds. A large weight, (56 lbs.,) is suspended by a cord from one of these rims, its distance from the centre being regulated by the pressure required. On bringing down the lever, and pressing the ornament, &c., on to the arched back of the book, the shorter end of the lever rises, pulling round the wheel; the weight being thereby raised, reacts with great force upon the lever.

In order to insure a level and properly

curved surface to receive the impression, the back of the book is rolled, either before or after lining, with a concave metal roller under pressure.

The claim is, 1. To the mode of compressing books or paper to be impressed or cut by means of the pressers worked by racks and cog-wheels driven by a screw.

2. To the mode of raising the platform for supporting books or paper, by means of two toothed wheels and toothed bars.

3. To the application of a dove-tailed slide and diagonal stay to the blade of a plough.

4. To the manner of working a chase, or ornamenting impressing surface, by means of the lever and apparatus connected therewith.

5. To the mode of constructing a chase or frame for holding type or ornamenting surfaces for impressing books and other surfaces, whereby such surfaces are securely held in such chases.

6. To the mode of combining a chase containing impressing surfaces, with a heater-box.

7. To the mode of preparing the backs of books, in order to insure uniformity of impressing the backs.

William Crosskill, of Beverley, Iron-founder and Engineer, *for improvements in machinery for rolling and crushing land; and in machinery to be used in the culture of land.* Enrolment Office, March 8, 1842.

The machine for the first-named purpose consists of a strong framing fitted with a pair of shafts for drawing by horses. Upon an axis within the framing are mounted, so as to turn freely and independently of each other, a series of rolling surfaces, the outer circumference of which is indented, so as to form angular teeth around it. Other teeth are fitted with their points in the hollows of the angular indents, at right angles to the rolling surface; these latter teeth are not placed in the line of the radius of the rolling surface, but inclined to it, so that they enter the ground more perpendicularly, and thereby have an increased tendency to penetrate and break up heavy lands, clods of earth, &c. Each rolling surface being free to turn upon the common axis, independently of the others, will, it is said, be found much more useful and effective than those heretofore made. When the machine is to travel on roads, &c., two large running wheels are put on the ends of the working axis, and removed when the operation of the machine is to commence.

The machine to be used in the culture of grass land consists of a strong framing mounted on four running wheels, the front pair having a locking motion; the object of this machine is to cause narrow cuts or trenches to be formed, at short intervals, through the turf down into the soil, and to deposit seeds and manure in such cuts or trenches. An axis or shaft lies across the front of the machine, and carries two arms, which, by connecting links, move bars that slide in grooves at the ends; these bars are affixed to a series of blades or cutters, (six in number,) by passing through an opening formed in the upper part of each cutter. These cutters pass down through slots or openings in a horizontal plate; by this arrangement, whenever the cutters become clogged, (which they are very likely to do,) the man attending the machine lifts the cutters through the plate, which instantly clears them from the accumulated soil or turf. In order to lift the cutters, and also to regulate the depth to which they shall work into the ground, there are two side levers attached to the axis or shaft, having sliding weights, in order to regulate the pressure used to force the cutters through the turf. Other levers connected to the foregoing pass over them to the hinder part of the machine, where they terminate in handles within reach of the attendant. An ordinary drill is placed upon the machine, and motion communicated to it from the driving wheels by toothed gearing, in the usual manner.

The claim is, 1. To the mode of applying the teeth of the rolling surfaces for rolling and crushing land; also, the placing rolling surfaces having teeth on the outer circumference, in such manner as to turn independently of each other.

2. To the mode of arranging a series of cutters in a suitable carriage, for producing narrow trenches or cuts through the turf of grass land, whereby such cutters can be lifted and cleared from time to time, and combining therewith suitable drills for sowing seed and manure in such cuts or trenches, as above described.

Theophile Antoine Wilhelme, Count de Hompesch, Rurich Castle, Aix-la-Chapelle, *for improvements in obtaining oils and other products from bituminous matters, and in purifying and rectifying oils so obtained.* Enrolment Office, March 1, 1842.

The matters to which this invention refers are schiste, or clay slate, and asphalte. The invention consists of an improved process whereby a greater quantity of oil is produced, the quality improved, and the smell removed, or greatly modified; it further consists of a method of subjecting the refuse matter of these substances to a process, whereby it is rendered available for other useful purposes.

The inventor states that the oil possesses three different characters, viz., essential oil, intermediary fat oil, and thick oil, and which

are separated by the following methods. The schiste, after having been cleaned, reduced to powder, and sifted, is put into a reservoir placed over the end of a retort. Between the reservoir and the retort is an iron box with two doors, one at the top communicating with the reservoir, and one at the bottom communicating with the retort. When the schiste is placed in the reservoir, the upper door is opened to allow it to descend into the box; the lower door is then opened to allow it to pass into the retort, the upper one being closed to prevent the escape of the vapour. In the retort—which is a circular pipe—is placed an Archimedean screw, by turning which the schiste is drawn forward; heat is then applied at the end of the retort until the temperature reaches 100° Reaumur, when essential oil will rise in vapour through a vertical tube placed near the end of the retort, and thence through other tubes into a condenser where essential oil is obtained. The charge having been subjected to this temperature for half an hour, the workman passes it by the application of the screw, farther along the retort, where it is then subjected to a heat of 200° Reaumur; by this increased heat the vapour is given off as before through a separate tube placed near the centre of the retort, thence through other pipes into another refrigerator, where the intermediary or fat oil is obtained. After having subjected the charge to this temperature for about half an hour, the workman again pushes the charge on to the further end of the retort, where it becomes of a red heat, and the vapour given out passes, as before, through its separate tubes, into another refrigerator yielding the thick oil. Every time the workman propels the schiste forward he opens the doors of the reservoir, so that the process is continued in its different stages without interruption. The refuse is passed on to the end of the retort, from which it falls into a box beneath, where it is left to cool.

As asphalte becomes liquid by the application of heat, it requires a different treatment from schiste, and the difficulty of distillation is considerable, because the bottom of the retort becomes covered with charcoal. To effect the distillation the inventor uses small iron retorts placed in a reverberatory furnace, so that the heat may act upon them on all sides. Each retort is 12 feet long, and 1 foot in diameter, and contains from two to three hundred pounds weight of asphalte. Five retorts are placed horizontally in one furnace, which is of a semicircular form. The projecting end of each retort has an ascending and descending tube attached thereto; [illegible] taining the most volatile oil into another tube whence it passes into its condenser; the descending tube conducts the vapour containing thick oil into another condenser. For obtaining essential oil from asphalte a heat of 130° Reaumur is necessary, and for thick oil 250°. The refuse of the carbonized asphalte is a hard black coal, which may be employed for the same purpose as the refuse of the schiste. Thus two oils are obtained, viz., essential and thick; to obtain the intermediary, the thick kind is subjected to distillation in iron retorts, by which means the intermediary is separated from the tar, which is very fine, and can be employed in the preparation of varnish, and for all purposes where the bitumen of India is now used.

The third part of this invention relates to a method of rectifying the oil thus obtained for manufacturing purposes. The fat oil is subjected to a pressure of steam, by which means any essential oil that may remain will be forced out, and any empyreumatic smell removed. The oil thus prepared requires to be passed through an ordinary filter, and is then ready for application to all kinds of machinery.

The essential oils obtained by the different temperatures may be used as solvents for caoutchouc, the manufacture of varnishes, the preparation of colours, and other similar purposes.

The fourth part of the invention relates to the treatment of the refuse arising from the several operations above described. The ammoniacal water formed in the distillation of the schiste is used in the manufacture of ammonia by the ordinary means. The acidulated tar will be found applicable to the production of the sulphate of soda, &c., by an addition of chloride of sodium in the ordinary manner. The coal or carbon, which contains pyrites when taken from the retorts, is placed in closed boxes to prevent the contact of the air, which whitens it; when cold and well dried, it is placed for twenty-four hours in a leaden vessel with water acidulated with sulphuric acid, which penetrates through all the pores, and attacks the iron; after having soaked twenty-four hours it is washed with cold water until no trace of the acid is left; it is then subjected to renewed carbonization; the refuse thus recarbonized is withdrawn, broken, reduced to powder, and sifted, and may be employed as a discolourant in sugar refinery, as a manure, and as a black colour.

George Wildes, Coleman-street, London, *for improvements in the manufacture of white lead.* Enrolment Office, March 4.

The lead is melted and poured through a metallic sieve into water; 200lbs. weight of the lead thus granulated is then placed in a hexagonal or square tub of wood lined with sheet lead. A hollow axis goes through the centre of this tub, and revolves with it; at

its other end the axis communicates with a generator of carbonic acid gas. The tub is placed so that the plane of its bottom forms an angle of 40° with the horizon, and is made to revolve at the rate of twelve or fourteen times per minute. The granulated lead being placed in the tub, a sufficient quantity of water must be added; being about half as much as the tub will contain in its inclined position; carbonic acid gas being introduced through the hollow axis, the lid or cover is put on, and the tub caused to revolve. In about twenty-four hours a quantity of white lead will have been formed, which is to be drawn off in vats, washed, dried, ground, and packed for use in the ordinary way.

The claim is to the formation of pure carbonate of lead, known to painters as good white lead, by the attrition of lead in water in closed vessels, supplied with carbonic acid gas; and the peculiar adaptation of the means above described.

NOTES AND NOTICES.

Death of the Electrical Eel.—The electrical eel, at the Royal Adelaide Gallery, died a few days ago. The cause of its death was mortification. It was brought to this country from one of the tributary streams of the river of the Amazons, about four years ago, and was the only one of its kind in Europe. Its structure was very singular. The seat of the electric power lay between the shoulder and the tail, and between the head and the shoulder. Its food was small fish, which it could stun and stupify by an electric shock, at two feet distance. The most interesting and beautiful experiment performed by its electricity was in setting fire to a piece of silver paper in a glass cylinder. One end of a conductor was attached to the paper, and the other to the eel, and by this means the paper was burnt. It was necessary that the eel should be irritated before it would send forth electricity.

Ploughing by Steam.—At a late meeting of the new Agricultural Society, which was held in Milwich School-rooms, Staffordshire, Mr. W. Blurton, of Field Hall, Uttoxeter, exploined his project of employing steam, instead of animal power, for the important purposes of ploughing. He said:—"In trying an experiment a short time ago, I discovered that ploughing might be as effectually, and quite as easily, performed with the power behind the plough, as by the usual method of dragging the plough after the power; therefore, I conceive that four or five ploughs might be arranged, and be propelled by a locomotive steam-engine, so that poaching the land in wet seasons might be entirely avoided. Steam power equivalent to 694 lbs. would be sufficient either to drag or propel a double plough, at a proper width and depth, 2½ miles an hour, leaving an excess of power of 356lbs., which latter power may be applied as will be subsequently shown. It is a well known principle in mechanics, that by decreasing the speed you may thereby increase the power; therefore agreeably to that principle, viz., by reducing the speed to one-fifth of 2½ miles, or to half a mile an hour, five double ploughs may be propelled at once, which decrease of speed will render the ploughs much more manageable, and the necessary number of turnings at the extremities of the furrows will consequently be reduced in nearly the same proportion. There are various means by which increased power may be obtained by decrease of speed, and I will instance one familiar to almost all, the *common crane*, which may be seen in many of the wharf yards in great varieties. An 8-toothed cast-iron pinion working in a 48-toothed wheel, will, by a common windlass and the power of one man, lift from the ground to the height required much more than half a ton. I will suppose, for instance, that only four double ploughs are arranged, and that two of them shall turn the furrows in the usual method towards the right hand and the centre of the land or butt, and the two other ploughs with the *mould boards reversed* turn the furrows to the left hand, also towards the centre; these altogether propelled forward by the engine would complete what is now called a four-'bout land or butt at once. It will therefore be obvious to every practical farmer, that by such an arrangement the ploughs will leave two open furrows, both of them solid and even at the bottom, which for all the purposes of steam-ploughing will serve as a railroad for the driving wheels of the locomotive engine to move along, and therefore much less *propulsion* will be required than if the wheels of the engine had to act on a soft or uneven surface. You will perceive that in the arrangement previously made four double ploughs were mentioned, and the consequence of decreasing the number of double ploughs from five to four will amply compensate for, or overcome, any difference in draught caused by the nature of the various tenacities of soil, or other circumstances. The excess of power before mentioned of 356lbs., acting on the foregoing principle of decrease of speed, will, I conceive, be sufficient to overcome the power necessary to move the engine alone. Four double ploughs moving at the slow speed of half a mile an hour, and plowing furrows ten inches wide, would plough on acre in two hours, allowing a reasonable time for turning at each end of the furrow.

Standard Weights and Measures.—A commission was some time ago appointed by government to institute a new inquiry into the present standard weights and measures, consisting of Sir John Herschell, Professor Airy, Mr. Lubbock, and others. The commissioners have reported, 1. That it would be advisable to adopt a decimal computation in all weights, measures, and monies; 2. That troy weight should be abolished, and avoirdupois substituted; and, 3. That proper model standards should be provided.

Royal Mail Company's Steam Ships.—A statement having appeared in the newspapers, that "the great size and general plan of construction of these steamers do not at all answer the expectations of their officers," Captain Chappell, the Secretary of the Royal Mail Steam Packet Company, has published the following strong contradiction. "The whole of the voyages," says Captain C., "made by this Company's steam-ships have exceeded the estimate which had been originally formed as to their probable speed; and as relates to the *Thames*, in particular, the only one of the Company's steamers which has yet returned to Europe, the Captain distinctly reports that her size, power, and construction, are admirably adapted for transatlantic navigation. The following abstract from her log will be conclusive, with persons conversant with such long voyages:—'The *Thames* was absent from England, altogether, 66 days; of these she was at anchor, in various ports, 20½ days; and at sea, 45½ days; whole distance run, 10,700 nautical miles—which is equal to a speed, throughout, of 238 miles per day.'"

Errata.—In Mr. Heineken's description of the Ancient lock of Combination, No. 963,

Line 8, for "Hutens," read "Buteus.

Col. 2, 12 lines from bottom, read "the second ring, V I O A E M; the third, I D L N V A; the fourth, R E I A S T."

Ibid., 2nd line from bottom, read "O V I R, F I D E, C O L I."

Page 54, 1st col., 8 lines from top, read "F I A T, S I L E, D I V I."

Ibid., 16th line from top, for "Schweuter," read "Schwenter."

In Table II., the fourth line should be "V I O A E M;" the sixth line, "I D L N U A; the eighth, "R E I A S T."

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Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 973.] SATURDAY, APRIL 2, 1842. [Price 3*d.*

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WORKSHOP BLOWPIPE.

Fig. 1.

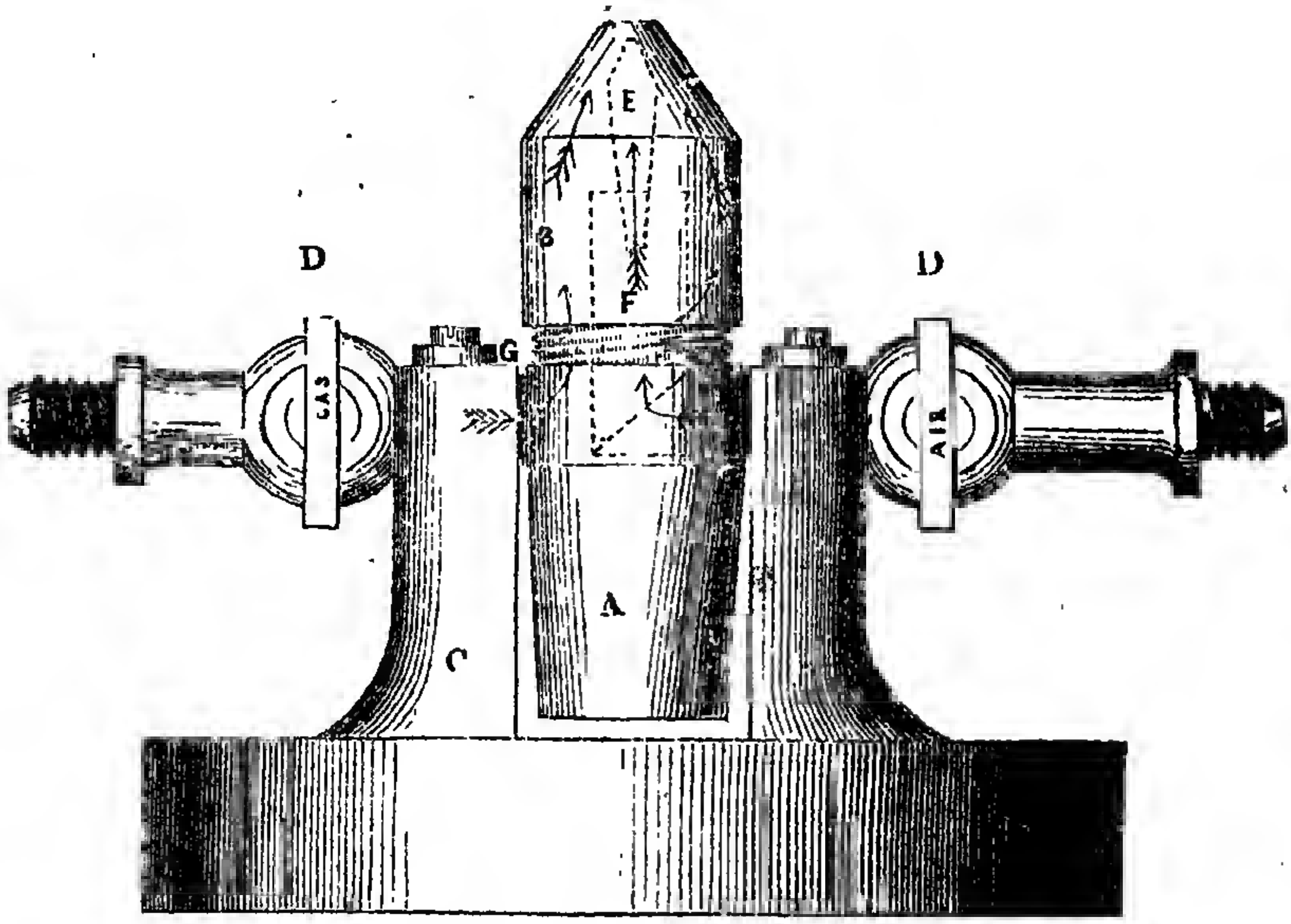
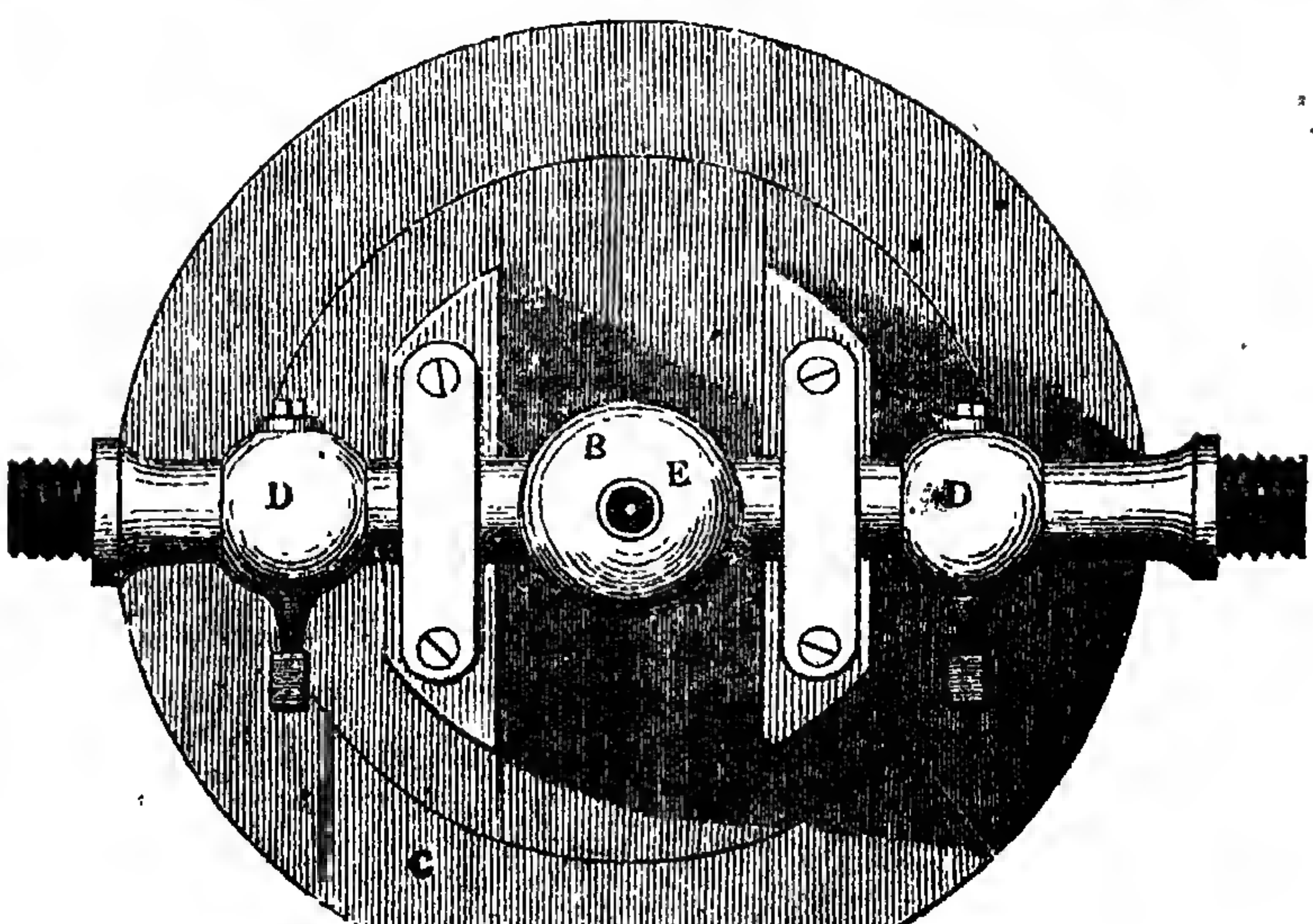


Fig. 2.



WORKSHOP BLOW-PIPE.

Sir,—I have found so much reason to be satisfied with the use of a little apparatus I lately made for myself, and have found it so much looked after by artisans in the place where I reside, that I venture to send you a description of it, in order that, if you think it likely to be of more extensive use, you may insert it in the *Mechanics' Magazine*.

I am, Sir, your most obedient,

K. H.

Description of a Blow-pipe Lamp of a convenient form for many purposes in the useful arts.

Fig. 1 is a front view, fig. 2 a plan, and fig. 3 a side view, of the apparatus, which may be constructed of larger or smaller proportions, according to the purposes to which it is to be applied.

A is a brass tube, closed at the lower end, and suspended in the wooden stand, C, by perforated trunnions having stop-cocks, D D, and screwed extremities, to which flexible or other tubes may be attached.

B, a piece of brass tubing, of the same diameter as A, but terminating in a cone, the apex of which is open. It is attached to A by the screwed part G, which requires to be so accurately fitted, that the combined tube may be lengthened or shortened by screwing or unscrewing B or A, without permitting the escape of gas from the inside.

C. The wooden stand.

D D. Stop-cocks for regulating the supplies of the gases.

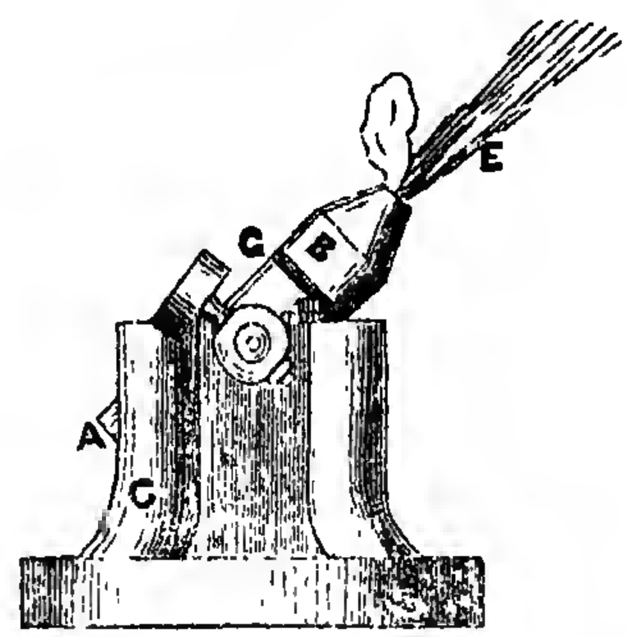
E. The nosel of the blow-pipe fitting into the socket F, concentric with the axis of A and B; the length of the shifting nosel should be such, that when B is screwed home on A, E should be just outside of the cone of B, and about one-eighth of an inch within it when B is unscrewed.

F is a continuation of the trunnion which leads to the air, or the oxygen gas holder, and is turned up in A by a right-angled knee, so as to bring the socket for E truly in the axis of the cone of B.

G. The adjustible connexion of A and B.

It will be obvious, on inspection, that no mixture of air and gas can take place in this apparatus, until they be outside of it; and also that, however great the pressure on the air-holder or bellows may be, it can never act in repelling the current of the inflammable gas, and that therefore there is no risk of the flame being blown out, which occasionally happens in other lamps, when the two gases flow into the same cavity before issuing.

Fig. 3.



The suspension of the apparatus on trunnions, like a howitzer, is not essential, but is convenient, as it affords the means of directing the jet of flame in any way it may be required for the work in hand.

When this apparatus is made on such a scale as to give 1 inch in diameter, and 3 inches in length, to A B, the tuyere or opening in the apex of B may be from ·15 to ·2 of an inch in diameter, and the pin-holes of the nosels may range from ·01 to ·03 of an inch. In these proportions it will be found very serviceable, in many workshops, for soldering silversmiths' work, hardening small steel tools, and a variety of other purposes: in the latter its use is invaluable, as the requisite degree of heat can be so accurately given, that no taking back is required after dipping; and the tenacity of the steel not being injured, tools so hardened last much longer keen than when they have been first made too hard, and then reduced.

When common street gas is used in this lamp with atmospheric air, a foot bellows may be employed to furnish the latter; but the better plan is to have an air-holder under water pressure, with an air-pump (similar to those commonly used for filling shower-baths) attached to it to fill it by. An air vessel 15 inches diameter, and 15 inches deep, will con-

tain air enough, under a pressure of from 15 to 30 inches, to keep the flame going, with medium expenditure, for half an hour, without pumping.

K. H.

March 14, 1842.

ON THE MANAGEMENT OF FURNACES AND BOILERS—BY C. W. WILLIAMS, ESQ.

Sir,—In my last communication on this subject, (No. 971,) I dwelt on the absolute necessity for having the means of observing what is going on in the interior of furnaces, and gave a plan of one of my own, which has been in use nearly two years, descriptive of the mode in which I apply sight-holes and thermometers for the purposes of inspection. By these means, and with further aids, which I shall presently describe, the various processes and changes, both in appearance and temperature, which take place as combustion proceeds, and the air is admitted or excluded, may be accurately watched and studied. These are daily witnessed by scientific and practical men, who freely express their conviction of the necessity for such inspection, before one can safely give an opinion on the changes, which they are thus enabled so deliberately to examine and appreciate, and the causes which produce them. For, with what pretensions to accuracy can we theorize on the chemical or practical results arising from the admission of air in different places and modes; or how assert that it will produce a heating or cooling effect, unless, by suitable means, we are enabled to ascertain the fact, and test the correctness of our own theories?

Again, how can we assert, as has been done with more boldness than truth, that when the coal gas (carburetted hydrogen) is all expelled from the coal, and the furnace exhibits what is called a "clear fire," there will be no combustible gas passing over the bridge, and no demand for air in that quarter—an assertion which the eye and the thermometer at once disprove, by the appearance of a flame of considerable length and intensity, whenever the means of internal inspection is afforded? Surely such facts should operate as a caution against deciding rashly on causes and effects, and until the correctness of our inferences can be determined.

In the management of furnaces, so as to effect the most perfect combustion and the largest measure of heat, the main considerations are those which concern the admission of air, as to mode and quantity, rather than the relative proportions of fire, flue, and boiler surfaces, or such merely mechanical details—considerations which are but of secondary importance, and essential only as they influence the admission of air, and its operations. As to quantity, and the mode of introduction, it is difficult to determine which requires the greater attention, or in which we have been most at fault: in other words, whether more mischief has been done by the admission of a *plus* or *minus*, the true chemical equivalent, than by the mismanagement of the quantity actually introduced; for on each will be found equally to depend the generation of smoke with its accompanying nuisance and waste.

Let us now suppose a sufficient body of clear, ignited, solid fuel, remaining on the bars, preparatory to throwing on a fresh charge of coal. In a furnace in this state, it is supposed that there is no demand for air, except for the combustion of such solid matter, and that the natural approach for it is by the ash-pit. This impression is unquestionably erroneous, and must be disproved before we can duly appreciate the value or necessity for the introduction of air in any other quarter, or for any other purpose.

The impression here referred to is drawn from the unquestionable fact, that when we open the furnace door to admit the new charge, we see neither gas, nor smoke, nor flame. The cause of this fact, however, as already observed, has been overlooked, namely, that it is the very act of opening the door, and thus admitting a large body of air, which has produced this absence of flame, or gas, in the process of combustion. That this is true, is proved by the other fact, that if we close the door—admit air in a proper manner, and then look in from behind, where I have placed the centre sight-hole, (see engraving in No. 971,) a flame of considerable length and intensity will then be visible, by which we are forced to the conclusion that a considerable quantity of gas, of some description, is then generated in the furnace, and may be consumed if proper means be

adopted. This will hereafter be more fully examined when speaking of the use of coke or anthracite.

Thus we see how mere ocular inspection disproves our previous notions and theories, and establishes this fact, that before we throw on the fresh charge, there is a gaseous, as well as a solid body, available for the generation of sensible heat; and as both are combustible, each must be supplied with its due proportion of air before its combustion can be effected. The gas here referred to is carbonic oxide — always invisible — never producing visible smoke, and its presence only detected by its assuming the form of visible flame. This is the gas also which M. Faber, by his ingenious and scientific contrivance has now rendered available in many of the processes of manufacturing iron, and even where an intense heat is required.

The furnace being in this preparatory state, let us suppose that it is receiving a full charge, which shall cover such previously ignited and glowing mass with a stratum of coal from six to eight inches thick, (according to circumstances and the size of the furnace,) and sufficient to last a considerable time before it is again reduced to the same condition, and ready for another charge. A new state of things is now induced—much combustible gas (carburetted hydrogen) is evolved from the fresh coal, and a commensurate demand is thus created for atmospheric air. How then is such demand to be satisfied? It is manifest that unless such newly evolved gas be supplied with air, it cannot be consumed —yet it is equally manifest that in the very act of charging the furnace we have counteracted our own avowed purpose, by thus thickening the mass on the bars, and consequently obstructing the passage of the air through them, from the ash pit—thereby preventing the possibility of its access at the very moment we have created a demand for an increased supply.

This, which we may well call a practical absurdity of our own creation, has always been admitted, and hence the remedies which have been suggested, the failure of which may, in most cases, be traced to a neglect of the mode in which the air is introduced. It remains however to the objectors of the present day, to deny the principle of admitting air, by a separate channel, and behind the bridge, on the assumed ground that it creates the evil of not regulating the supply to the demand. Had the old plan of confining the admission of air to the ash-pit and bars been perfect in the way of regulation and adjustment, such objections might have had their weight; we have seen, however, that it is the reverse of regulation and the very antipodes of equalling the supply to the demand.

That there is some self-adjusting principle in the nature of combustion, (when not counteracted,) by which the quantity taken up or absorbed by the gas, shall, to some extent, correspond with the quantity required, we are warranted in believing, seeing how the varying quantities required for the combustion of the same gas in our lamps are supplied. We see, in the argand burner and solar lamp, how, by merely aiding the introduction of the air in a peculiar manner, we effect a more complete combustion, and by a species of self-adjusting appropriation. Why then condemn, against the evidence of our senses, the introduction of air to the furnace, on the same principle which is so successful in the lamp? Would not the inductions of common sense rather suggest an inquiry into the causes of such success, and whether there be not something peculiar—not in the air, or the gas—but in the *mode* of bringing them together? This consideration, however, belongs to another branch of the subject, and we are now but tracing the practical results in a furnace as they are presented to our view.

It will be admitted that effecting an absolute harmony between the demand for and the supply of air, is a desideratum of the greatest importance. If this, however, be not practicable, can we make no approach towards so desirable an object? At least, can we not correct the evil of the old system, which by diminishing the supply as the demand increases, produces an effect the very opposite of that which we are in search of? To this then let us direct attention, rather than by unmeaning cavil and theoretic objections, discourage useful investigation, and retard practical improvement.

It is manifest that the increased demand for air, on the new charge being thrown on the furnace, has been caused by the great developement of gas from such charge. It is also manifest that as the increased supply to meet such de-

mand cannot be obtained by the old channel — the ash-pit and bars—some other arrangement, and some other channel must be sought for. Two supplies are required, the one for the solid, and the other for the gaseous combustible—so also are two distinct orifices for admission called for; and as every introduction of new fuel creates a new and additional demand for air, which cannot be obtained through the more than ever obstructed bars, a new and separate channel of admission becomes indispensable. The self-evident remedy is providing two means of supply, giving to each an independent action, and keeping both, under all circumstances, open and undisturbed.

By thus dividing the supply of air, we have made the first step towards regulation; for as the fresh charge of coal, had, as it were, shut the door against itself and its own demand—by giving a separate door, we prevent the recurrence of such mischievous influence or interference. Our next step is to inquire to what extent these separate supplies require adjustment. For this purpose we have to examine the combustible gases generated, and their order of succession from the beginning to the end of the charge, each succeeding charge being but a repetition of the same order of causes and effects. We shall thus have to inquire the results as to the temperature produced, and the most desirable or practicable management as regards the admission and action of the air in supporting combustion.

The fresh charge being in action, the evolved gases will be, in the first instance, the carburetted and bi-carburetted hydrogen—the proportion of the latter being governed by the nature of the coal, and the intensity of the heat in the furnace, and, to no small extent, its depth and distribution in the bars. This will be confirmed by the appearance of the gas in combustion—the bi-carburetted being the most brilliant white, and giving the strongest light behind the bridge, though not so in the body of the furnace. For this purpose the furnace may be considered as a species of retort, with the double duty, first, of generating the gas, and then of heating it to the proper temperature for chemical action—but certainly, to a very small extent of effecting its combustion, and for the reason already adduced, namely, the impossibility of its being supplied with its equivalent of air. This mixture of gases then changes to that of carburetted hydrogen alone, which, continuing for some time with an uniform flow, gradually diminishes in quantity until the whole is expelled. The remaining solid matter or carbon, becoming clear and incandescent as these gases are evolved, produces that state of things which is essential to the generation of the carbonic oxide, and which, in its turn, increases to its maximum, as exhibited by its peculiar blue and transparent flame; after which it diminishes, the quantity evolved being in proportion to the quantity of solid carbon or coke on the bars—the activity of the draught, and the intensity of the heat in the furnace. If the air be excluded from behind the bridge, this gas (carbonic oxide) will be imperceptible, passing away useless, wanting its due supply of oxygen, and of course a *pro tanto* loss. If, however, the air be judiciously applied, so as not to produce a cooling effect, this gas at once becomes visible with its peculiar flame. The order in which the combustible gases present themselves for combustion will then be as follows:—

1. Carbonic oxide, before the charge.
2. Carburetted and bi-carburetted hydrogen.
3. Carburetted hydrogen alone.
4. Carburetted hydrogen and carbonic oxide.
5. Carbonic oxide alone.

In my next I will give a tabular view of the quantities developed; their respective lengths and temperatures, and the relation they bear to the admission or exclusion of the air.

I am Sir, yours, &c.
C. W. WILLIAMS.

Liverpool, March.

NEW METHOD OF ORNAMENTING FANCY CUTLERY.

Sir,—I beg to communicate to you a description of a mode of ornamenting sword-blades and fancy cutlery, which is, to my knowledge, quite new; and you will oblige me by inserting it in the columns of your interesting and useful Magazine.

The process is explained in a very few words. It consists in applying *printed*

impressions to the surface of the articles, and afterwards immersing them in the usual acid liquor. Sword-blades, knives, steel snuffers, and scissors—in fact, every description of fancy hardware goods in steel—can be thus beautifully ornamented, with expedition and cheapness. The plates from which the impressions are taken may be like those used by pot-painters for porcelain, but the ink should be composed of about equal parts of common asphaltum and bees'-wax, laid on hot, and printed at the rolling-press. Perhaps wood engravings might be employed for the same purpose; in which case, they would, of course, be printed at the typographic press, with an ink composed of asphaltum varnish mixed with a little bees'-wax. In both cases the goods ought to be warmed a little when the impression is transferred thereto, so as to cause the ink to adhere.

I am, Sir,

Yours respectfully,

M. T. BRAZENDALE.

March 21, 1812.

METHOD OF PRODUCING EXCELLENT DAGUERREOTYPE PRINTS WITHOUT THE AID OF AN ENGRAVER.

Sir,—Every body who may have had an opportunity of seeing an impression from an electro-etched Daguerreotype plate will have perceived in it a generally poor effect, arising from the indent not being of sufficient depth to hold the molecules of the printing-ink in requisite quantity; this is at least the case if the minute details of the picture are left clear and well defined. On the other hand, should the plate be etched to the proper depth, all the exquisite and inimitable beauty of the finer parts is destroyed. The following method will produce an effect closely approximating to that observed in ordinary prints, and vastly superior to any of those heretofore executed *simply* by Mr. Grove's method.

A Daguerreotype is first etched by the voltaic process invented by Mr. Grove,* when an impression is taken therefrom, on "transfer paper," using the kind of composition ink usually employed for transferring operations.† This impression is transferred to a lithographic stone, the surface of which is finely *grained* by rubbing it with sand, and a muller. The stone is then prepared with acid, &c., and printed impressions taken as usual. The pictures are *positive*, that is, they have their lights, shades, &c., precisely as in nature.

I am inclined to think that laying an *aquatint ground* on the Daguerreotype plate, previous to its undergoing the electro-etching process, would greatly improve the copper-plate impressions, as by giving an uneven, instead of a flat surface, the ink will necessarily *hold* better. The etching-ground may, if thought fit, be taken off after the plate is slightly corroded, and afterwards finished without it.

I am, Sir,

Your very obedient servant,

M. T. BRAZENDALE.

Newcastle, March 21, 1842.

STEAM-BOILER EXPLOSIONS.

Dear Sir,—Previously to reading the paper of M. Jobard upon this subject, I had made several experiments, with a view of ascertaining whether, after the hydrogen gas is formed in the boiler from the decomposition of the water by the heated plates, the explosive mixture might not be completed by the steam itself, independently of any atmospheric air, which might obtain access to the interior of the boiler from the feed-pumps, or otherwise. From several experiments, accurately and carefully made, I am induced to believe that such is the case; and that when once an evolution of hydrogen gas has taken place in the boiler, we need not look for the other ingredient of a dangerous and highly explosive mixture, such mixture being immediately formed by the steam. I have burst a small wrought-iron boiler under such circumstances, that no air could possibly have been mixed with the steam, having first carefully expelled it from the water which I used. I allowed the water to get very low in the boiler, and fired it by means of a platinum wire ignited by a galvanic battery. When once we have an explosive mixture formed in the boiler, I think no difficulty will be found in kindling it: a sudden rush of steam will lift the safety-valve, when imme-

* Vide Proceedings of the London Electrical Society, vol. i. 1841, page 94.

† That containing the smallest quantity of lamp-black ought to be chosen.

diately the electric spark will pass between it and the seat.

Another theory, which I believe to be purely original, and certainly only the offspring of the moment, is this: may not a sudden evolution of steam or gas cause a sufficient degree of compression to produce ignition? We know that a piston, by being forcibly pushed down into a cylinder, causes sufficient heat to inflame amadon or German tinder—may not so powerful an agent as steam produce the same effect? However, this is but the idea of a moment; but every little helps to elicit truth.

I am, Sir,
Your most obedient servant,
COMMENTATOR.

Eltham, March 25, 1842.

WALKER'S HYDRAULIC ENGINE.

Sir,—The description of Walker's Hydraulic Engine, by Mr. Baddeley, in your valuable magazine, did, I must confess, a little astonish me; but not so much as seeing it at work afterwards at the inventor's manufactory. The term "cylinder" which your correspondent uses, led me a little astray so far as regards the exact principle on which it depends for action. I thought there was something *within* the cylinder which was not explained, and I have no doubt others of the many readers of your magazine have been led away by the same idea. However, upon examining the apparatus for myself, I find all that is required to raise water is a common zinc or other metal tube, with a valve at the bottom opening upwards. The enlarged space at the bottom is only to give more water way than would be afforded if the tube was of the same diameter throughout. There is one particular part which I wonder escaped the scrutinizing eye of your correspondent, and that is, the mode of putting a new leather or plate on the valve, when required, without a joint or flange on the pipe. There is no attempt in this instance to improve the ordinary pump, for every thing connected with it is thrown overboard, and an entirely new principle substituted of immense value, which will only be duly appreciated as it becomes known. A new field is opened for the expansive powers of never-tiring genius. Mr. Baddeley's account of it is very good; but it appears to me impossible to judge of its real merits without seeing it in action. I have no doubt the shipping interest will be the first to examine into the principles of this wonderful invention; as it appears to me well adapted for maritime purposes, and may no doubt be applied with certain success in all works of magnitude where hydraulic machines are indispensable, or where water is to be raised. I have given Mr. W. two orders for the purpose of raising water from foundations of buildings, which I have no doubt will be a great saving of labour, and also in repairs.

I am, Sir,
Your most obedient servant,
A BUILDER,
AND A CONSTANT READER.

London, March 29, 1842.

THE LEEDS SMOKE NUISANCE REPORT.*

The promised Pamphlet on the Smoke Nuisance, by Mr. West—the fruit of the great meeting at Leeds—is at length published, and we must confess that we are sadly disappointed with it. It is, in effect, little more than a gratuitous advertisement of all the schemes of all the smoke-doctors throughout the kingdom, with their names, addresses, prices, testimonials, &c.; differing chiefly from the useless Report of the sage Committee of the London Corporation in this, that whereas the London Report contained only seven plans, the Leeds contains, (with much vaunting of the numerical superiority,) "upwards of forty." The question of the practicability of annihilating the smoke nuisance, without prejudice to the many important manufacturing interests involved in it, is left, just where it was; and instead of the pamphlet furnishing any help to manufacturers or others, to see their way through the labyrinth of assertions and testimonials—which last the most worthless,

* An Account of the Patent and other Methods of Preventing or Consuming Smoke; with Acts of Parliament on the Subject, Evidence on Indictments for Smoke Nuisances, and the Proceedings at a Public Meeting of Patentees and others for Exhibiting and Explaining Models. By William West, Professional Chemist, Leeds. Simpkin and Marshall, London; Baines and Newsome, Leeds.

as well as the best, have at command—it only makes "confusion worse confounded." Many inventions, which had deservedly fallen into obscurity, are here resuscitated with the stamp of official notice, if not recommendation. The descriptions of several deviate materially from the original specifications of the patentees, the inventors having, apparently, availed themselves of what appeared to be the favourable points of others. One and all are depicted in the most glowing colours. Every one is just the thing for economy, and for consumption of smoke—though, whether it be possible to consume smoke at all is still a question in dispute among men of science. We had expected, at the hands of Mr. West, something like a rational, deliberate, and scientific analysis—something that should lead, rather than puzzle the practical part of the public—something that should at least have separated the dross from the ore, and have thus circumscribed the field of inquiry—something that might have served to take the subject out of the range of mere mechanical invention, which has too long usurped the place of science in all that relates to this matter. The merely enabling each pretender to throw his rubbish into the heap—thus overwhelming the little there is of a sound, useful, and practical character—has effected nothing towards clearing the way for those who are really desirous of abating the nuisance, or of enabling Parliament to legislate with safety. The Leeds Meeting should either have done more, or done nothing: much embarrassment, possibly much mischief, seems likely to result from this originally well-intentioned, but most abortive effort.

Some general remarks of a cautionary nature are indeed made by Mr. West, but not greatly to the purpose. He seems, evidently, to have been a good deal embarrassed by his position—between a desire to do his duty, as a reporter, with literal fidelity, and a dread of lending his authority, as a man of science, to any one scheme more than another. He has not thought it to be within his province even to analyze, much less to condemn or recommend. The pamphlet, as it is, seems to have cost him no little trouble, but it has been trouble thrown away, for the whole will be as soon forgotten as any other mere collection of advertising puffs. The practical reader and manufacturer may, in laying it down, ask, with equal propriety and success, the question which was put to the panegyrist of the far-famed Sorbonne, after a century of incubation—"Well, and what has it done?"

THE "ANTI-JOHN-SCOTT-RUSSELL" AND MR. BENINGFIELD'S CHALLENGE TO ALL THE WORLD.

The writer of the Note in the *Mechanics' Magazine* of the 19th instant, on the *Anti-John-Scott-Russell* experimental steam-boat, presents his compliments to Mr. John Beningfield. He admires Mr. Beningfield for his boldness in backing his friend Mr. Beale's "whirligig" against "the world," for a trip "from Greenwich to Richmond, and back again;" but begs respectfully to submit whether it would not have been as well to choose ground for the match, where "all the world," if so inclined, might enter into the competition. He presumes it must have been from mere oversight that Mr. Beningfield has pitched on a portion of the river where notoriously the swifter steam-boats do not, and are not, able to ply. What does Mr. Beningfield say to a trip the other way, from Greenwich to Gravesend, or from Gravesend to the Nore, or from the Nore to Calais? If he will amend his challenge, so as to give all "the world" plenty of room and fair play, it will very probably be accepted. Even then Mr. Beningfield, with his "considerable experience in steam-engines generally," must no doubt be well aware, success on either side would affect but little, if at all, the question raised in the Note to which his challenge is a reply. That question is this, simply—whether there is any thing in the construction of Mr. Beale's rotary engine to make it probable that it will, *in the long run*, work better than any of the numerous engines of the same class which have gone before it—to oblivion? The writer of the Note thinks there is not; and he is prepared to state his reasons, if Mr. Beale, or his champion Mr. Beningfield, will first of all, (to prevent any future cavilling about the facts of the case,) state in what respects the *Anti-John-Scott-Russell* "whirligig" differs from preceding rotary engines, and the special grounds on which the inventor flatters himself that he has succeeded, in so extraordinary a degree, where so many others have utterly failed.

London, March 28, 1842.

METROPOLITAN MUSIC HALL—HANSOM'S NEW SYSTEM OF BUILDING.

A plan is now before the public for the erection of a Metropolitan Music Hall, of truly colossal dimensions. It is to be half as large again as Westminster Hall—"the noblest hall *(as yet)* perhaps in the world;" and is to be capable of containing fifteen thousand persons. The organ too is to be of corresponding magnitude—"an organ exceeding in dimensions, power, and grandeur, all that the Continent, so great in this respect, can exhibit"—"the ORGAN of London, of England, of Europe, of the World!" And the cost of the building (the most surprising part to us of the whole affair) is to be no more than £30,000.

The author of this design is Mr. Joseph Hansom, the architect of the universally admired Town Hall of Birmingham—one of the very finest of our modern public buildings; and the means by which he calculates on being able to erect a hall of such unparalleled magnitude, at a smallness of cost so equally unparalleled, is the application to roof building of the suspension principle, followed in the construction of the Menai, Vauxhall, and other iron bridges. We quote the following explanatory details from a lecture delivered last week by Mr. Hansom, at the Music Hall, Store Street.

"According to the ordinary system of building, the sides are made to receive, to all intents and purposes, the whole weight of the roof, and pressing unequally, that is, at points, the beams or principals of the roof lying transversely upon the walls, and the weight increasing by confluence, as it were, towards the middle, that is, in the very weakest part of the building. The ends, too, be it observed, equal in all the features, and capacity to sustain pressure, yet not loaded at all, or at most, by the ends of a few rafters, resting on a dangerous and insecure gable. But the *corners* of the building —those *towers* of latent strength, if I may so term them, for all the purposes for which they are so eminently designed, seem as superfluous as the strength contained in them —that is, the present system of building is such as to so regard them; but mind you, there is only one plan by which this great fund of strength and sufficiency can be called into action, and it is by proceeding on that beautiful principle of making force converge to a centre, instead of diverging from it, tending inwards, as gravitation does, instead of pushing outwards, as incohesive and disturbed elements operate. And what think you is that mode of construction, which so calls into action this latent strength? It is neither more nor less than that of the suspension bridge.*

"By suspending, therefore, the great weight of the roof from the four corners, we not only impose the pressure upon fixed and equal points—and to impress equally—but we make use of the natural abutments, which the walls of the corners supply by their meeting, to prevent any derangement of the upright position; that is, if one of the walls could experience a draught inwards through the pulling force of the suspension rods, the other wall is pushing against to resist it; and so of each wall, mutually and reciprocally, and of each corner.

"Here then we fall again on another beautiful principle of the ancient masons. In their groined vaultings, they regarded walls merely as a means of inclosure, not of support; and hence we find, that the arch ribs were collected together at a small number of bearing points, or piers, (they might be termed the legs of the building), and their tendency to thrust outwards was counteracted by buttresses, sometimes flying over, from a distance of several feet, and crowned by heavy pinnacles to increase their resistance by weight. Yet beautiful, magically beautiful as was their device, we have no need of it; the very thing, which they resorted to, as an expedient, exists in the nature of the construction of all square buildings; and had they known of the principle of suspension, as they knew of that of the arch, of which their early predecessors were ignorant, they would no doubt have adorned and used it with similar triumphs.

"Away then with the necessity of outward buttresses, and massive side walls—away with columns of support—away with inequalities of pressure, and their consequence, fracture and derangement—all we require are the corners of our building; or, if we would lighten them still more, we interpose a strut between; but indeed the very outward frame of the roof performs this office; resisting compression, it also stays the corner piers in their place; it is their best, I may call it, their *faithful* auxiliary.

"Away also with high pitched roofs, and the steep sloping sheets of tiles and slates—the forest of timber, which so large a roof as this would require, loaded by its mass of

* "A building of great dimensions has recently been erected at Paris, called "La Rotonde des Panoramas." The roof, which is pitched, and partly on the old construction, is suspended by iron cables. The design is by M. Hittorf, architect of the French Government, under whose patronage it was built."

extra covering, grinding down the walls by their united pressure, and pregnant with the elements of decay and destruction (the liability of timber to rot, and its fearful combustibility). Away also with the drafts from the Northern forests of Europe, and our dependencies upon a foreign supply of timber. The mines and rocks of our native country are our resource, and our manufactures are stimulated. Iron, in its best form, in its malleable state, not cast; tensile to a proverb, as we say, "tough as pinwire." Iron rods or cables; iron rafters; iron gratings and frames, to receive an impermeable cement, all secure, and next to imperishable.*

"This little model shows how, with a load equal to fifty, nay, a hundred times its proportioned weight of covering, the rods perform their duty. And I must stop at this point to tell you, that the power of wrought iron to bear suspended weight is such, is so astounding, as that a rod 1 inch square, will bear 80,000lbs. or 35 tons. The whole weight of the roof of the proposed Hall will be about 200 tons, including that which is to rest upon the piers and arches, therefore four rods of an inch square each would suffice to carry it; but I should have a power equal to forty such rods at least, or ten times the bare sufficiency."

Of the soundness of this new principle of construction we have not a shadow of doubt; and cannot help wondering that with so many striking examples before our eyes of its successful application in bridge building, no one should before now have thought of its still greater suitableness to roofs of buildings of large area. Doubtless the saving must be great from dispensing with the huge system of piers, pillars, posts, &c., now requisite in all cases, where roofs of large dimensions on the ordinary plan have to be sustained; and we are disposed to put every trust in the estimates on this head of a gentleman of Mr. Hansom's great practical experience; but we foresee other advantages as likely to arise from his suspension plan of roofing, which would make the cost a matter of comparatively small moment. Buildings may be raised on this plan on a scale of magnitude, as well in respect of height as of area, which could not be erected at all on any other plan; and with greater height than has been ever before witnessed in our public buildings, with one or two rare exceptions, we may expect to see a vast improvement in all those architectural details to which height is auxiliary. Liability to fire will also be greatly diminished by the general substitution of iron for wood in building; we say general substitution, for once applied to roofing, that would infallibly lead the way to its adoption for floors, staircases, doors, windows, &c., to all of which it is equally applicable.

To the Music Hall, both for its own sake and for the sake of the new system of building likely to be identified with it, we cordially wish every possible success.

* Referring to one exhibited in the Lecture Room.

MESSRS. RENNIE'S NEW ENGINE.

Sir,—Your remarks on Messrs. Rennie's engines seem to imply that the double cylinder engine has been shelved in London as well as by its "Cornish patrons." Now this is not quite correct, as these engines have long been the staple manufacture of the Messrs. Hall, of Dartford, who besides furnishing our French neighbours with a great number, who duly appreciate them on account of their small consumption of fuel, can point to many of their erection in London and its environs, as well as in different parts of the country. There is also the firm of Messrs. Easton and Amos, of the Grove, Southwark, who manufacture these engines to some extent, and have many of them doing their work exceedingly well in London and its neighbourhood. I believe there are two of 25-horse power each, of their construction, at Battersea flour-mills, and, I am told, so beautifully does the last erected perform, that in the dark, you would not know she is at work, but for the breathing of the steam through the passages. Besides the above, there are doubtless other parties who construct this kind of engine, and therefore the assumption "that the engineering world has been taken by surprise" by what is termed the "re-production in the metropolis of an engine upon this principle, by engineers of eminence" must be incorrect.

With regard to the consumption of fuel, I believe the Messrs. Hall guarantee 3½lbs. per horse per hour; but 3lbs. I am given to understand is very seldom exceeded; and Easton and Amos's engines are equally successful, I apprehend, in this particular.

The Messrs. Rennie's engine is said not to consume more than 2·2lbs., but sufficient data to warrant such a conclusion have not yet appeared. The removal of three probably old crazy engines of the nominal power of sixty horses, is insufficient, as they were unlikely to perform more than thirty-five or

forty, and from the difficulty of ascertaining the real amount of duty in consequence of the nature of the work on which they were employed, I feel inclined, in the absence of further particulars, to take the power exerted by the new engine at 40 horses; divided by which, the consumption of fuel will agree with that required by the engines of the above experienced manufacturers, the Messrs. Hall, and Messrs. Easton and Amos.

The engines manufacted by the above firms, expand, I believe, only four times, which gives an advantage to the Messrs. Rennie, as their engine expands five; but much will depend upon the construction of the boiler employed by each party, as a difference in that respect may give an advantage with so small a consumption as to cause a variation of perhaps 25 per cent.

I have taken occasion to remark long ago in the *Mechanics' Magazine*, and other publications, that though engines had attained a very high degree of perfection, boilers generally were still very rude, unsafe, inefficient, and without principle, either in construction, the application of heat, or the exposure of the water; and I am glad to see Mr. Williams has in your last Number also denounced the existing boiler practice in similar terms.

I have also urged in your pages, and elsewhere, that the kind of engine in question is the only one by which the greatest possible effect can be obtained, and therefore the fittest for steam navigation—not, however, that steam exerts a greater power by expanding in two cylinders, than it does in one, but because the use of two cylinders "equalizes" the power more nearly; that is to say, it reduces the difference between the commencement and termination of the stroke to a smaller amount than it is possible to effect in one cylinder, thus producing a more equable motion, a more convenient and manageable application of the principle, and thereby affording the means of carrying it out to the utmost profitable extent of which it is capable, but which it has not yet attained. This is the advantage of employing two cylinders, though the Messrs. Rennie were of opinion, not long since, that there is no more advantage in expanding in two cylinders than there is in one. It seems, however, they have found reason to become converts, and I hope they will oblige us with the result of the experiments said to be in progress with their new engine.

I remain, Sir,
Your most obedient servant,
ALPHA.

Limehouse, March 28, 1842.

RECENT AMERICAN PATENTS.

[Selected and abridged from the *Franklin Journal*.]

IMPROVEMENT IN DRY DOCKS; *Charles F. Johnson*. This dock operates on the principle of those which raise the vessel by having inverted boxes under the cradle, into which air is introduced to exclude the water, and the patent is granted for a mode of preserving the equilibrium of the cradle and prevent rocking, which is effected either by means of vertical screws attached to each side of the cradle, and passing through nuts on each side of the dock, or by racks with ratchets into which palls work, or by ropes passing around pulleys attached to the sides of the cradle and dock.

LAYING VENEERS; *Casper Kittenger*. A board of any given length and width, to be governed by the size of the article to be veneered, passes through mortices made in two pieces of hard wood, one placed at each end. A mortice or slot is made in each of these pieces of wood, parallel with the one through which the board passes, to receive two rods of iron having a screw and nut on each end, to prevent them from falling out of the slot, but not screwed tight enough to prevent them from sliding along the length of the slots. To these rods is attached a band or sheet of iron, leather or cloth, reaching nearly the whole length, and hanging loose from one to the other, so as to form about a half cylinder. The board is provided with any given number of hand screws, which pass through it and act upon the back of the article veneered, thus forcing the veneered surface against the band which adapts itself to the form of said surface. The claim is to the combination of the screws and bands, as described.

IMPROVEMENT IN THE MODE OF PACKING ROTARY STEAM ENGINES; *John D. Aikin*. This improvement is only for the packing of those parts which present two or three faces. The part to be packed is provided with a groove, into which the metallic packing is fitted. This packing consists of two metallic plates put together by halving the pieces where they meet, in the manner of a square-shouldered splice, and two screws, with conical ends, are employed to spread and force out the two halves, the conical end of each screw passing in between the end of one piece and the shoulder of the other; so that as the screws are advanced the packing will be forced out and spread endwise. This kind of packing is described as applied to the steam heads and sliding valves of a rotary steam engine. The claim is to the mode of packing "by means of the countersink, halved plates, and conical screws."

IMPROVEMENT IN SPRING SADDLES; *Orren M'Cluer*. The leather of the saddle

seat, instead of being attached to the head of the tree, is attached to a spring which is fixed to the head of the tree, or to the straining web, which connects the spring and the back of the saddle. The skirts of the saddle lap over the covering of the seat sufficiently to allow the play of the spring, without allowing the edge of the covering of the seat to be drawn from under them. This arrangement allows full play to the spring without straining the covering of the seat.

Mode of Stretching Cloth in the process of Fulling; *B. D. Whitney, and G. W. Lawton.* The cloth is carried round a series of rollers, one of which has its surface cut into a right and left-handed screw, each commencing in the middle and running out to the end. As this roller or double screw revolves with the cloth drawn over it, it will stretch the cloth widthwise. The same object is more effectually attained by making the surface of the roller in sections, sliding from the middle towards each end; the surface being seared or grooved so as to take hold of the cloth. The sections or segments project at each end beyond the body of the roller, and the part which projects is provided with a roller which fits into a spiral groove in a stationary cylindrical block at each end, and the grooves are so arranged that as the segments move round when they come to that part of their circuit in which they meet the cloth, (which is only in contact with a portion of the circumference,) the segments move outwards, stretching the cloth from the middle towards each edge, and when they leave the cloth they are drawn in.

Improvement in Grist Mills; *Edward Gray.* This improvement consists in placing a pair of small stones in the eye of the runner to prepare the grain before it passes to the large stones. The under one of the two small stones rests upon the driver of the large runner, and revolves with it, and the upper one is driven in the opposite direction by a driver attached to a small shaft, which takes the place of the damsel; its lower gudgeon working in the upper end of the main spindle. The grain is fed into the eye of the small upper stone, and after being partially ground, passes to the large stones to be ground into flour or meal. The defects in the common grist mill, which the patentee says he has overcome, are, "1st. The slowness of the grinding performed around the eye of the common stones, owing to the slow movement of the runner at this part of it, and the consequent insufficient supply of prepared grain for flouring, or being ground into flour, which is accomplished by the surfaces of the stones near the circumferences thereof, where the movement is quicker. And 2nd, the introduction of too much cool air between the stones through the eye of the runner."

Improvement in Breast and Pitch Back Water-wheels; *Edward Robbins, Jr., and William Ashby.* This improvement is designed to admit of the escape of the air which remains in the buckets after they have received the water from the flume, and allowing it to escape through openings in the sole or lining of the wheel, as the buckets, in their descent, are being immersed in the back, or tail race water. The buckets are either radial, or inclined to the radii, and do not reach the sole or lining of the wheel, but leave an open space between the two, which is closed by a flap either hinged to the back of the bucket, or turning on pivots in the shrouding, so as to operate as valves or shutters, the back or inner edge closing against the sole or inner lining directly above the hole made through it for the escape of the air in the bucket below. As the bucket descends, the back of the flap comes in contact with the water in the tail race, which opens it, and passes into the bucket following, forcing the air contained in the bucket, above the water, out through the hole in the sole or lining. Were it not for this arrangement, the patentee says the "air would be carried down, and be forced to descend with the buckets through the back water. This carrying down of the air, it must be manifest, would offer a considerable resistance to the motion of the wheel, and that it does so, is well known to us from most satisfactory experiments which we have made. What we claim, is the employment of valves in buckets of water-wheels, such valves having the position herein described, and being used in combination with the openings through the soling of the wheel, that is to say, said valves forming an angle of 130°, more or less, with the radiating buckets, or with radii of the wheel, and closing against its soling immediately above the opening, for the escape of air."

Preparing White Lead Paint; *James N. Trovillo.* This improvement consists in incorporating with a given quantity of white lead, equal, or nearly equal, quantities of linseed oil and of pure water, preparatory to grinding the paint, by first carefully incorporating the water and lead, and then adding the oil, and also in subsequently reducing it to a proper consistence by the addition of the same materials in the same proportions. The patentee says "I do not claim to be the first to have incorporated linseed oil and water together in the preparation of paint, with a view to economy in the use of the former article, this having been done by the

aid of lime or other alkaline substances; but what I do claim is, the producing of this combination by the agency of white lead alone, substantially in the manner set forth, for the purpose of producing a mixture to be employed as a paint applicable to all the objects to which white lead paint is ordinarily applied."

IMPROVEMENT IN STEAM BOILERS; *Jacob B. Eversole.* The patentee states, that the object of his improvement is to prevent the vapour, generated at the bottom of the boiler, from coming in contact with the bottom of the flue, and there forming a sheet, which prevents the water from coming in contact with the heated metal. This he effects by means of a semi-cylindrical guard plate of metal, which he places between the bottom of the flue and the bottom of the boiler, and supports by legs or rods resting on the latter. The steam that is generated at the bottom of the boiler, in rising, comes in contact with the bottom of the guard plate, which carries it up and prevents it from coming in contact with the bottom of the flue. It is evident, however, that the remedy will only be partial, for the steam which impinges upon the bottom of the guard plate, will soon elevate its temperature until it becomes nearly equal to that of the steam, and this will generate steam above the guard plate, which in rising, will impinge upon the bottom of the flue. The claim is confined to the placing of a guard plate between the flue and the bottom of the boiler.

IMPROVEMENTS IN MACHINERY FOR REMOVING STUMPS; *Miles C. Mix.* It would be useless to attempt to give a clear idea of this machine within the narrow limits of this notice, without drawings; suffice it to say, that the chain which is attached to the stump, and by which it is drawn up, is attached to a revolving shaft, on which it is wound as on a windlass, by means of a peculiarly arranged system of gearing, which facilitates the change of relative velocity between the point where the force is applied and the shaft on which the chain is wound. This shaft and gearing are placed in a frame provided with two wheels at one end, and a truck roller at the other, so arranged as to allow the ends of the frame to rest on the ground, that the whole may be attached or anchored for operation.

LIST OF DESIGNS REGISTERED BETWEEN FEBRUARY 24TH, AND MARCH 24TH, 1842.

Date of Registration. 1842.	Number on the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Feb. 24	1106	R. Laidlow and Sons	Lamp	3 years.
"	1107	Henry Brinton	Carpet	1
25	1108	Albert Potter	Ditto	1
"	1109	John Thomas and G. Clarke	Ditto	1
"	1110	George Worley	Skeleton conductor for lamps	3
28	1111	James Yates	Stove	3
March 2	1112	Wm. George Bentley	Projecting letters	3
3	1113	Wm. Hancock	Battledoor	1
4	1114	Joseph Hall	Drill harrow	3
7	1115	Southwells and Co.	Carpet	1
"	1116	John Knowles	Portable shower bath	3
9	1117	Charles Millard	Sofa	1
"	1118	Henry Fearncombe	Oblong coal-urn	3
"	1119,21	Wright and Crump	Carpet . .	
10	1122	C. J. Redpath	Troops fire hearth	3
"	1123	Wm. Hancock, jun.	Nail	3
"	1124	Barlow and Cole	Carpet	1
11	1125	Albert Potter	Ditto	1
14	1126	Henderson and Co.	Ditto	1
15	1127	John Sheldon	Letter and coin balance and pencil and pen-case	3
"	1128	Henry Longden and Son	Stove	3
"	1829,37	J. and F. Kipling	Carpet	1
"	1138	Charles Dowse	Fire basket with boiler	3
"	1139	John Vernon	Screw clamp and plate for stereotype moulds	3
17	1140	W. Troubeck	Stained paper	1
"	1141,2	C. Meigh	Jug	1
18	1143	Davy Brothers	Inlaid cap for carriage wheels	1
"	1144	Mrs. Larbalastier	Shawl	3
21	1145	William Bridges Adams	Under side frame for railway carriages	1
"	1146	Joseph Schlasinger	Inkstand	3
"	1147	E. H. Bentall	Way pin for ploughs	3
22	1148	James Yates	Pier table	3
23	1149	J. and A. McNab	Fishing reel	3
24	1150	Alfred Leigh	Design for cutting, &c., tobacco, &c	3
"	1151,3	H. and J. Dixon	Carpet	1
"	1154	Henry N. E. McEvoy	Boot and shoe fastening	3
"	1155	Sandes and Williams	Harrow	3

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 24TH OF FEBRUARY, AND THE 23RD OF MARCH, 1842.

William Newton, of Chancery-lane, civil engineer, for certain improvements in regulating the flow of air and gaseous fluids. (Being a communication.) February 25; six months to specify.

Osborne Reynolds, of Belfast, Ireland, clerk, for certain improvements in covering streets, roads, and other ways with wood, and also in the means of enabling horses and other animals to pass over such roads and other slippery surfaces with greater safety than heretofore. February 25; six months.

John Birkby, of Upper Ramfold, York, card manufacturer, for improvements in the manufacture of wire cards. February 25; six months.

William Saunders, of Brighton, gentleman, for improvements in apparatus employed in roasting and baking animal food. February 25; six months.

Samuel Morand, of Manchester, merchant, for improvements in machinery or apparatus for stretching fabrics. February 26; six months.

Benjamin Gillot, of Great Saffron Hill, cutler, for improvements in heating and ventilating. February 26; six months.

Marc La Riviere, of London Fields, Hackney, gentleman, for certain improvements in the machinery for figure weaving in silk and other fabrics. March 1; six months.

Thomas Smith, of Northampton, plumber, for an improvement, or improvements in water-closets. March 1; six months.

George Carter Haseler, of Birmingham, jeweller and toy-maker, for improvements in the tops of scent bottles. March 3; six months.

Edward Slaughter, of Bristol, engineer, for improvements in the construction of iron wheels for railway and other carriages. March 4; six months.

James Clements, of Liverpool, manufacturer of toys, for improvements in composition for ornamenting glass and picture frames, and articles for interior and other decorations, also for the manufacture of toys and other fancy articles March 4; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the construction of candle lamps; March 4; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in vessels for making infusions or decoctions, and for culinary purposes, and in apparatus for measuring or supplying from vessels. March 4; six months.

John Green, jun., of Newtown, Worcester, farmer, for certain improvements in machinery, or apparatus for cutting or reducing turnips, mangel wurzel, carrots, and other roots, for food for horned cattle, horses, and other animals. March 7; six months.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery or apparatus for cleaning, carding, roving and spinning cotton and other fibrous substances. March 7; six months.

James Readman, of Islington, gentleman, for a certain improvement, or improvements, in the barometer. March 7; six months.

John Duncan, of Great George-street, gentleman, for improvements in machinery for excavating soil (Being a communication.) March 7; six months.

John Warrick, of Laurence Pountney-lane, Cannon-street, merchant, for an apparatus called a "Gasoscope," and intended to show the presence of bi-carburetted hydrogen gas (the gas used for lighting) in mines, wells, houses, buildings, rooms, or vaults, and consequently, to prevent the explosion and accidents liable to be produced by the said gas. (Being a communication.) March 7; two months.

Francis Kane, of Cumberland-street, Middlesex Hospital, mechanic, for improvements in the construction of fastenings for the parts of bedsteads and other frames. March 7; six months.

Sir Francis Desanges, of Upper Seymour-street, Portman-square, knight, and Anguish Honour Augustus Durant, of Long Castle, Shropshire, esq., for improvements in apparatus for sweeping and cleaning chimneys or flues, and extinguishing fires therein, which they intend to call "Ramoneur." March 7.

Robert Frampton, of Cleveland-street, Fitzroy-square, coach-maker, for improvements in the construction of hinges. March 7; six months.

Henry Barrow Rodway, of Birmingham, Warwick, wine-merchant, for improvements in the manufacture of horse-shoes. March 7; six months.

Thomas Henry Russell, of Wednesbury, iron-tube manufacturer, and Cornelius Whitehouse, of the same place, for improvements in the manufacture of welded iron tubing. March 7; six months.

William Newton, of Chancery-lane, civil engineer, for an improved machine or apparatus for weighing various kinds of articles or goods. (Being a communication.) March 7; six months.

Thomas Hedley, of Newcastle-upon-Tyne, gentleman, and Cuthbert Rotham, of Gateshead, Durham, for an improved apparatus for purifying the smoke, gases, and other noxious vapours arising from certain fires, stoves, and furnaces. March 7; six months.

William Catford, of Chard, Somerset, mechanic, for certain improvements in machinery or apparatus for making or manufacturing lace or other netted fabrics. March 8, six months.

Henry Smith, of Liverpool, engineer, for improvements in the construction of wheels and breaks for carriages. March 10; six months.

Richard Beard, of Earl street, Blackfriars, gentleman, for improvements in the means of obtaining likenesses and representations of nature and of other objects. March 10; six months.

William Edward Newton, of Chancery-lane, civil engineer, for certain improvements in boilers, furnaces, and steam-engines. (Being a communication.) March 10; six months.

Charles William Firchild, of Wesley-park, Northfield, Worcester, farmer, for an improved propelling apparatus for marine and other purposes. March 14; six months.

Reuben Partridge, of Cowper-street, Finsbury, engineer, for certain improvements in machinery or apparatus for splitting and shaping wood into splints for the manufacture of matches, and other similar forms. March 14; six months.

Alfred Green, of Sheffield, surgical instrument-maker, for certain improvements in trusses or surgical bandages. March 15; six months.

Edwin Ward Trent, of Old Ford, Bow, rope-maker, for an improved mode of preparing oakum, and other fibrous substances, for caulking ships and other vessels. March 21; six months.

Sydney Jessop, of Sheffield, merchant, for an improved mode of preparing wrought-iron intended for wheel-tires, rails, and certain other articles. March 21; six months.

Zachariah Parkes, of Birmingham, manufacturer, for certain improvements in apparatus for grinding and dressing wheat and other grain. March 21; six months.

John Clay, of Cottingham, gentleman, and Frederick Rosenborg, of Sculcoates, York, gentleman, for improvements in arranging and setting up types for printing. March 21; six months.

William Hancock, the younger, of Amwell-street, gentleman, for certain improvements in combs and brushes. March 21: six months.

Edward John Dent, of the Strand, chronometer-maker, for certain improvements in chronometers and other time-keepers. March 21; six months.

William Brockedon, of Queen-square, gentleman, for improvements in manufacturing fibrous materials for the cores of stoppers, to be coated with India-rubber, and used for stopping bottles and other vessels. March 21; six months.

John Haughton, of Liverpool, clerk, for improvements in the method of affixing certain labels. March 21; six months.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture and preparation of pills, and some other articles of a medicinal or remedial nature. March 21; six months.

Mark Freeman, of Sutton-common, Surrey, gentleman, for improvements in the construction of inkstands. March 21; six months.

Robert Hazard, of Clifton, Somerset, confectioner, for improvements in apparatus for heating public and private buildings. March 21; six months.

Moses Sperry Beach, of Norfolk-street, Strand, printer, for improvements in machinery used for printing with type, and in the construction of type for printing. (Being a communication.) March 23; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN 22ND OF FEBRUARY, AND 22ND MARCH, 1842.

William Baker, of Grosvenor-street, Grosvenor-square, surgeon, for certain improvements in the manufacture of boots and shoes. Sealed February 23.

George Haden, of Trowbridge, engineer, for certain improvements in apporotus for warming and ventilating buildings. February 23.

Joseph Henry Tuck, of the New North-road, Hoxton, engineer, for improvements in apparatus or machinery for making or manufacturing candles. February 25.

Hugh Lee Pattinson, of Bensham-grove, Gateshead, manufacturing chemist, for improvements in the manufacture of white-lead, part of which improvements are applicable to the manufacture of magnesia and its salts. February 25.

Matthew Allen, of High Beech, Essex, doctor in medicine, for an improvement in producing uneven surfaces on wood. (Being a communication from abroad.) March 2.

Thomas Stopford Jones, of Stafford-place, Pimlico, gentleman, for certain improvements in machinery for propelling vessels by steam or other power. March 2.

Joseph Garnett, of Haslingden, county of Lancaster, dyer, and John Mason, of Rochdale, machine-maker, for certain improvements in machinery or apparatus employed in the manufacture of yarns and cloth; and are in possession of certain improvements applicable to the same. (Communicated from abroad.) March 8.

Joseph Drew, the younger, of St. Peter's Port, island of Guernsey, confectioner, for an improved method of rolling and cutting lozenges; and also of cutting gun-wads and other similar substances, by means of a certain machine described by him, and constructed of divers metals and wood March 7.

George Jarman, of Leeds, flax and cotton spinner, Robert Cook, of Hathersage, County of Derby, heckle and needle manufacturer, and Joshua Wordsworth, of Leeds, machine maker, for certain improvements in machinery for spinning flax, hemp, and tow. March 9.

James Ions, of Newcastle-upon-Tyne, gentleman, for improvements in smelting copper ores. March 10.

Julius Bordier, of Austin Friars, London, merchant, for certain improvements in preparing skins and hides, and converting them into leather. (Being a communication from abroad.) March 11.

Richard Laurence Sturtevant, of No. 42, Church-street, Bethnal Green, soap manufacturer, for certain improvements in the manufacture of soap. March 14.

William Hickling Burnett, of Ravensbourne Wood Mills, Deptford Creek, gentleman, for improvements in machinery for cutting wood, and in apparatus connected therewith, part of which may be applied to other purposes. March 14.

George Wildes, of Coleman-street, London, merchant, for improvements in the manufacture of white lead. (Being a communication from abroad.) March 16.

PATENTS GRANTED FOR IRELAND IN FEBRUARY, 1842.

Sam. Hall, for improvements in the combustion of fuel and smoke.

David Stead, for certain improvements in constructing, or paving of public streets and highways, public roads, courts, paths, bridges, cottages, and other houses with timber or wooden blocks, and in the machinery, or mode of manufacturing the said blocks.

James Ions, for improvements in smelting copper ores.

J. Border, for certain improvements in preparing skins and hides, and in converting them into leather.

J. Steward, for certain improvements in the construction of pianofortes.

A. Templeton, for a new improved method of preparing for spinning silk and other fibrous substances

J. Coleman, for improvements in the manufacture of starch.

M. Macdonagh, for improvements in spindles, flyers and bobbins, for spinning, roving, twisting and reeling all sorts of fibrous or textile substances, and in the application, or adaptation of either, or all of them to machinery for the same purpose.

H. H. Watson, for certain improvements in dressing, stiffening and finishing cotton and other fibrous substances, and textile and other fabrics, part, or parts of which improvements are applicable to the manufacture of paper, and also to some of the processes or operations, connected with printing calicoes and other goods.

W. Palmer, for improvements in the manufacture of candles.

F. R. Conder, for improvements in the cutting and shaping of wood, and in the machinery used for that purpose.

NOTES AND NOTICES.

Fatal Steam-boat Accident on the Clyde.—The *Telegraph*, a passenger-boat worked on the high-pressure principle, has been blown up, and a great many persons killed and wounded. The *Greenock Observer* furnishes the following—rather lame—explanation of the cause of this melancholy disaster:—"On Tuesday the boiler was inspected by scientific gentlemen, who gave it decidedly as their opinion, that the accident occurred wholly from carelessness and inattention. The boiler shows by its appearance that it had been overheated. We understand that a regulator, attached to the engine and boiler, for the purpose of ascertaining the pressure, had gone wrong in the morning passage up to Glasgow, and it is supposed that this had prevented the engineer from knowing the amount of pressure. It is stated, likewise, that no steam was allowed to escape when she stopped at our quay, nor at Helensburgh. At low water, the boiler, &c., was sufficiently exposed to enable it to be examined to see in what state it was. The engineer, Mr. Rawland, who made the engine, caused an examination to be made, and he states the following to be the result of the investigation thus made:—'The accident has evidently been occasioned by the want of a due quantity of water in the boiler, as the plates in the crown (or cover) of the fire-box had been red-hot. On examination, we find the plates riven completely across; and the heat has been so great, that though

the fire-box (or furnace) is only about three feet three inches wide, the plates are stretched or expanded so as to measure four feet; and there are also on the plates several large blisters, which could only be the result of the intensity of the heat. The violence of the explosion has been so great, as to tear one of the corners of the fire-box a considerable way down, the plates at that corner being five-eighths of an inch thick. The same rent goes through a solid bar of iron, three inches by two. So far as can be seen, none of the tubes are injured. The fire-box was made of the best Lowmoor plate, of the following thickness:—Tube-plate, five-eighths of an inch; back, half an inch; crown, seven-sixteenths. Tube and back-plates welded.'" The names of the makers of the engines and boilers are not given; it seems only fair that they should be published. We should be glad to know, also, whether there are any boats on the Thames—whether of Clyde or Thames construction—now at work on the same *explosive* and *life-regardless* principle.

Archimedes and his Lever.—Quetelet, in his *Positions de Physique,* calculates that if the common centre of gravity of the earth and the moon be taken as the fulcrum of the lever with which Archimedes boasted he could move the world, the lever would require to be of such length as to extend amongst the fixed stars fifteen thousand millions of millions of times the distance of Saturn, Saturn's distance being three hundred millions of leagues; and that to have raised the earth one single foot, he would have had to act throughout a period of twenty-seven millions of millions of years, even supposing that he traversed the space requisite with the swiftness of a cannon-ball.

Miniatures on Marble.—Thin polished plates of white marble are now strongly recommended, by several French artists, as a substitute for ivory in miniature painting. The slices of marble are cemented down upon a sheet of board-paper, to prevent danger of fracture: they are said to take the colour with great freedom, and to hold it with tenacity; and it is obvious, that they are incapable of any change by time, or the effects of heat or damp. Ivory, it is well known, becomes yellow; and in hot climates often splits or warps. It can only be obtained, also, of a very limited size; whereas, these plates of the finest grained statuary marble can be obtained of any size. Plates of about 12 inches by 10 inches are prepared of only about three-sixteenths of an inch thick, and smaller ones thinner in proportion. Marble has been occasionally used, before now, as a plane for painting on *in oils;* but its application to miniature painting is certainly new, and seems valuable. —*Repertory of Patent Inventions.*

Inlaid Marbles.—A beautiful mode of ornamenting marbles has recently been brought into use in Paris:—It consists in etching, by acids, deeply into the marble, various designs upon a properly prepared bituminous ground. When the corrosion has gone sufficiently deep, the cavities are filled up with hard coloured wax, prepared so as to take a polish equal to that of the marble when cleared off. Drawings thus made on black marble, and filled in with scarlet wax, after the manner of Etruscan, and certain Egyptian designs, are said to have a very noble effect, and are applied to tables, panelling, stoves, &c., &c.—*Ibid.*

Continental Machinery.—We perceive in the *Eco della Borsa* of Milan, that extensive mills have been erected in Lombardy for spining of cotton and silk, and that there is now being added another on a very extensive scale, for spinning and weaving of flax and hemp. It is undertaken by a public company, at the head of which is S. Battaglia the banker. It is situate near Milan, on the Adda. We observe that the entire direction of projecting and executing this new concern was confided in 1840 to Mr. Albano, C.E., of London: it is stated to be the most complete mill in all its details that has ever been erected. The powerful water wheel, and the mill gear for driving the spinning machinery, are of a superior description, and were made in this country, by the celebrated firm of W. Fairbairn and Co., of Manchester. In consequence of the prohibitory character of our export laws, the spinning machinery is to be made in Belgium, although the Company was most desirous that it should be made in England. Here is another example of the ruinous effects being produced upon the country, through the absurd prohibitory laws. We thus see that an order of several thousand pounds is taken out of our hands. How long this is to last it is impossible to say.—*Civil Engineer and Architect's Journal.*

Thames Tunnel.—"The entire brickwork of the horizontal roadways, and the two shafts for the footway descents have, in the course of the last year, been safely completed. The entire brick structure, therefore, of the Tunnel, uniting the two opposite shores of the Thames, is now wholly completed, requiring only works of an ordinary character, to speedily adapt it for public use. The staircases of the two shafts for foot passengers have been contracted for by Messrs. Grissel and Peto, and will be completed in a few months, when the Tunnel will be forthwith opened to the public as a thoroughfare. The directors must express their satisfaction at the strong and durable character of the work, notwithstanding the trials it has undergone by the repeated irruptions of the river, and the loose and dangerous nature of the ground through which the work of excavation and of construction has been carried on. The brickwork remains perfectly solid and secure in all parts. Once erected under the protection of the shield, it has never given way in the slightest degree; nor has a step in advance, once gained, and secured by brickwork, ever had to be reconstructed, even though newly done and exposed to the utmost fury of the torrents of irruptions. The directors deem it their duty to state this, because it furnishes an explanation both of the cost and of the delay of the work.—*Report of Directors.*—[If not "a step in advance once gained and secured by brickwork has ever had to be reconstructed," how can this possibly account—as alleged—"*both* for the cost and the delay of the work?" The irruptions of the river may have caused delay; but the doubling and more of the cost can only have arisen from gross miscalculation.—Ed. M. M.]

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SCOTT'S PATENT FLOUR-DRESSING MACHINE.

Fig. 1.

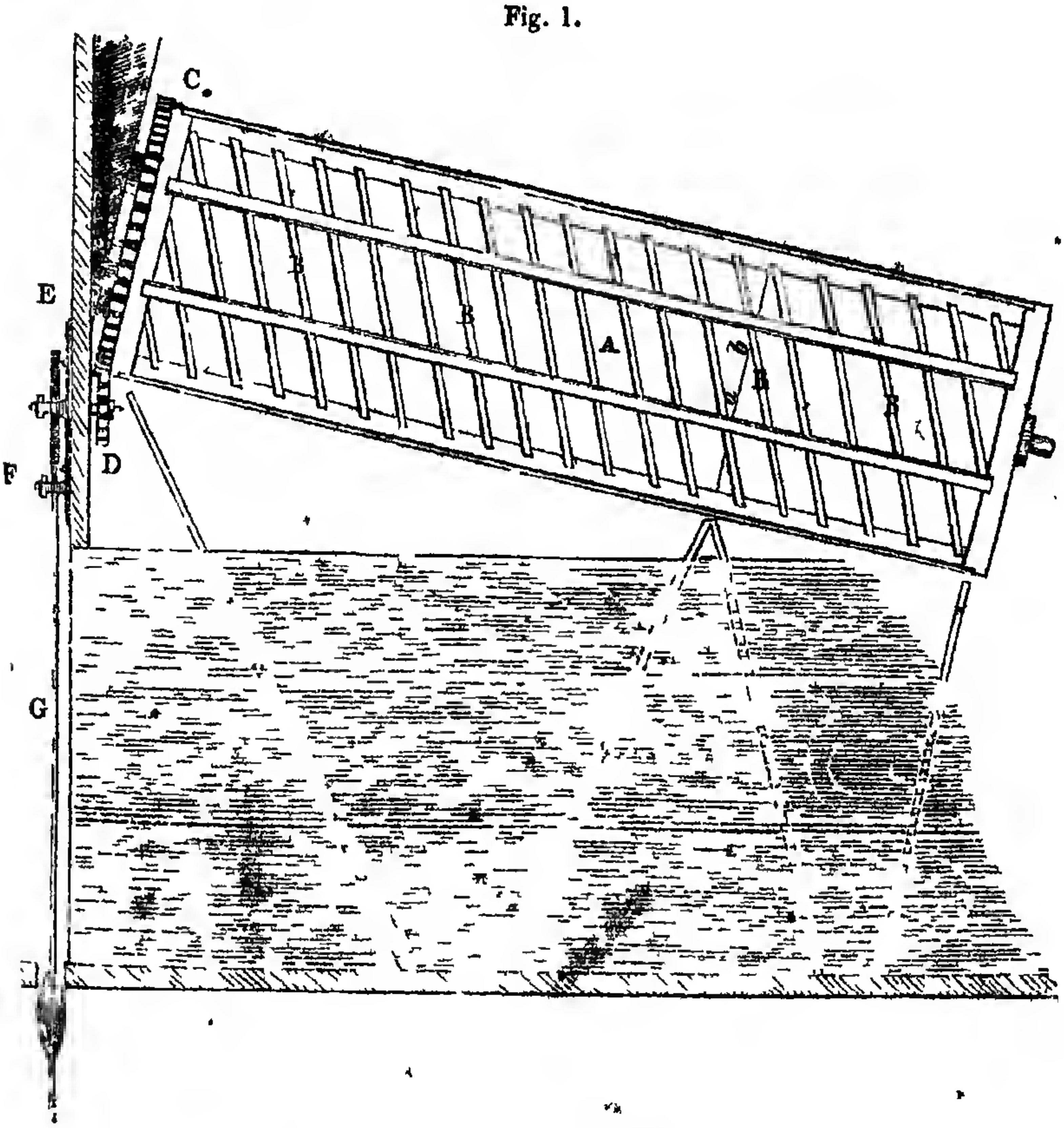
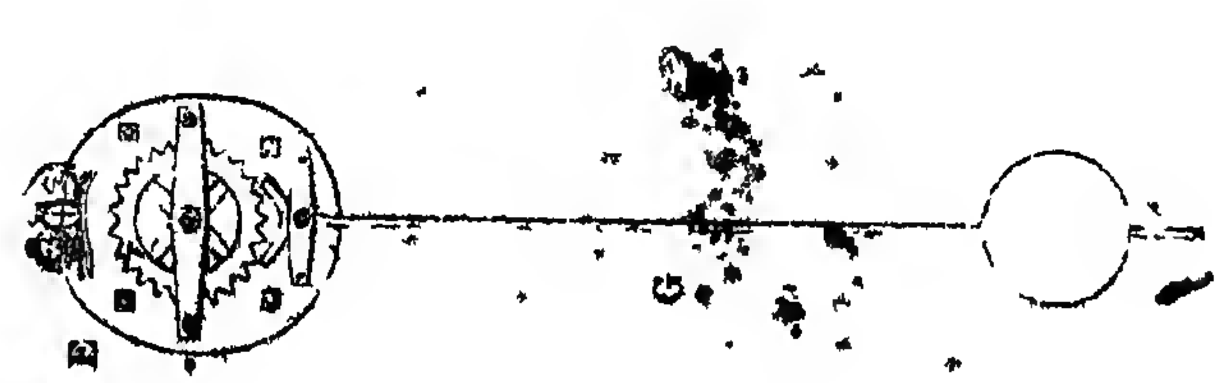


Fig. 2.



SCOTT'S PATENT FLOUR-DRESSING MACHINE.

[Patent dated September 23, 1841; Specification enrolled March 23, 1842.]

A bolting-mill, and a flour-dressing machine (as some of our readers may probably require to be informed) are two different things; the former being an article of some antiquity, while the latter is of modern invention, and has, to a great extent, superseded the other. The bolting-mill produces only two descriptions of meal, flour and pollard, or bran, while one flour-dressing machine is capable of producing as many different sorts, four five, or more, as may be required. Of old, it was necessary, when more than two varieties of fine and coarse flour were required, to have several bolting-mills, with cloth of various degrees of fineness.

The modern flour-dressing machine (in its most ordinary form) consists of a cylinder of hoops, or ribs, lined with wire-cloth, and a reel within it, armed with brushes; both cylinder and reel having one common axis, or shaft, but the reel only revolving, while the cylinder remains stationary. The extremities of the shaft rest in bearings in the ends of a large case, or box, which encloses the whole apparatus, but the bearings are at such different elevations as to give a considerable inclination to the cylinder. The wire-cloth is manufactured in pieces of 4 feet in length, to suit the internal diameter of the cylinder, and 9½ inches in breadth; so that supposing the cylinder to be 38 inches long it will take four pieces of cloth to line it, which may be of four different degrees of fineness. The first breadth of cloth is generally of sixty meshes to the inch, and a slight degree coarser than the next, which is of sixty-four—an arrangement found desirable, because when the meal is first introduced into the cylinder (from a feeding hopper above) it is still moist and warm from the stones, and would be apt to clog the meshes of the finer quality of cloth. The third and fourth pieces are of thirty-eight, and sixteen meshes to the inch. The bran which is too large to pass through any of the wires, passes out at the end of the machine. The part of the case below the cylinder is divided into the same number of compartments as there are pieces of wire-cloth of different degrees of fineness, each compartment being appropriated to the reception of the particular quality of flour projected through the wire-cloth immediately above it, by the rotary action of the brushes within the cylinder. When four is the number, the different qualities are called firsts, seconds, thirds, and pollard.

Greatly superior as this machine is to the old bolting mill, it is not without its defects.

In the first place, the wire-cloth wears rapidly away at the places where it is in contact with the ribs, from the action of the brushes against them, the number of which places in a cylinder 38 inches in length, is not less than twelve, so that a cloth becomes, in these places, unfit for use, when in all others it is, perhaps, as sound as ever. Hence a great expense for new cloth; hence, also, very frequent interruptions to the working of the machine from partial rents or failures, and endeavours, not always successful, to repair them without going to the expense of an entirely new lining.

In the second place, from the cylinder being always stationary, the parts of the wire-cloth below the axis have a great deal more work to perform than those above, which is another source of unequal wear; and quantities of unexpelled flour collect and settle in the bottom of the cylinder, to the great prejudice of its general action and efficiency. Many attempts have been made to obviate this objection by giving a rotary action to the cylinder, as well as to the brushes, and there are not a few mills in which, at the present day, this is actually done; but the rates of going which it is proper to give to the two parts of the machine are so different that it has been found a matter of the greatest difficulty to proportion the one to the other, and in no instance has it been hitherto done, except by means of most complicated and cumbrous contrivances. The brushes are usually made to revolve at the rate of about four hundred times in a minute; but the cylinder ought not to revolve oftener than once in three or four minutes.

Both these defects are at length completely remedied by the improved machine we are now about to describe—by means, certainly, of exceeding simplicity, but not on that account the less meritorious, or the less likely to be efficient.

The first defect, Mr. Scott (of Louth)

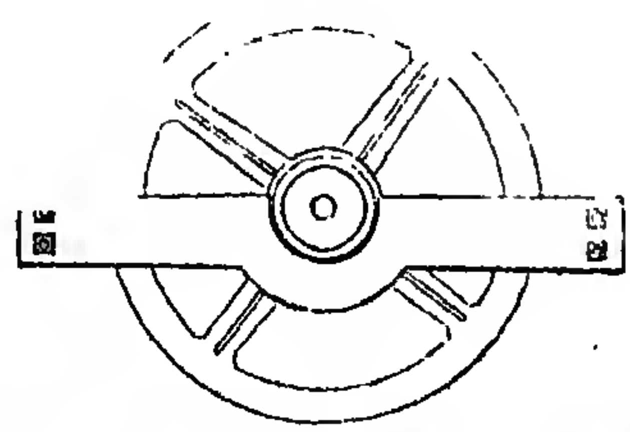
the patentee of the new machine, tells us, arises simply from fixing the ribs of the cylinder in *straight* lines, parallel to the top and bottom of the cylinder, or, in other words, at right angles to the axis of the cylinder. And who can doubt for a moment, (the thing being once pointed out) that he is right? Try to rend a piece of wire-cloth in the rectangular direction of the threads—nothing is easier; but try to rend it diagonally, or in a direction from corner to corner of the piece, and you will find that the thing is next to impossible. Behold, then, the obvious remedy. Mr. Scott places the ribs of his machine at such an angle (about 25°, as represented in the prefixed engraving, fig. 1) in respect to the threads, or meshes of the wire-cloth, that they shall be "more or less in the line of greatest resistance to tearing and rending."

"To prevent the angular position given to the ribs from diverting any of the finer or coarser portions of the flour into partitions other than those allotted to them, circular bands or plates of copper, or any other suitable material, as *a*, *b*, fig. 1, and of about the depth of the ribs, are inserted into the cylinder in positions parallel to the ends, and outside of the wire-cloth, at those places where such partings are desired to be made. Each piece of wire-cloth commencing with that at the top of the machine overlaps the one next below it; and to prevent the brushes from starting or raising the edges, and to keep these edges flat and even, each joining is covered with a strip of copper, or other suitable metal nailed over the cloth to the ribs."

The additions to the machine by which the second objection is got rid of, are also of admirable simplicity. We quote the ingenious inventor's own description.

"C C is a cog-wheel, or rather series of cogs affixed to the head of the cylinder A; D is a pinion which takes into the cog-wheel, or cogs C C; E is a plate fixed vertically to the head of the cylinder case, carrying the pinion D, and a pallet wheel F; G is a pendulum, the rod of which carries at its upper end two palls, which, as the pendulum vibrates, take alternately into the teeth of the pallet wheel. A separate view (as seen in front) of the additions E, F, and G, all of which, with the cogs C C, and pinion D, are peculiar to my said improved dressing machine, is given in fig. 2. The effect of imparting rotation to the cylinder, being of necessity to set in motion, all the gear work in connexion with the cogs C C; it follows also, that according to the relative proportions of the wheels and the weight and length of the pendulum, will be the rate at which the cylinder revolves. In order to lessen the friction of the cylinder in its rotation, the bearing at the tail end is made of the reduced size and form, represented in the plan, fig. 3."

Fig. 3.



Several machines of this improved description are already in use—one at Mr. Carpenter's Mills, Greenwich, which we have had an opportunity of seeing at work, and working to the perfect satisfaction of all concerned. We have no doubt, that in a short time this will be the only sort of flour-dressing machine in general use.

IMPERFECT BALANCING IN MACHINERY, A GREAT BUT NEGLECTED SOURCE OF LOSS OF POWER—THE CAUSE ALSO OF THE ROCKING AND JERKING MOTION COMMON TO LOCOMOTIVE ENGINES.

The *Midland Counties Herald* has contained lately some excellent reports of a series of lectures on Physical Mechanics, delivered by Dr. Melson at the Birmingham Philosophical Institution, and in every way deserving of being well reported. We have been much pleased with the sound and practical character of these lectures—the clearness of the lecturer's descriptions—the abundance and fitness of his illustrations—and the ability, as well as frequent originality of his suggestions. The sixth of these lectures was chiefly occupied with the exposition and enforcement of certain views on the friction arising from the imperfect balancing of machinery, first made public in the pages of this journal

by the ingenious Mr. George Heaton of Birmingham, whose persevering attempts to apply steam power to common road travelling must be fresh to the remembrance of our readers, as is also, we trust, the good sense and candour with which he ultimately abandoned them. Our Birmingham contemporary's report of this lecture we subjoin.

BIRMINGHAM PHILOSOPHICAL INSTITUTION.

Dr. Melson's Sixth Lecture on Physical Mechanics.

The great interest of this lecture consisted in the elaborate exposition which it contained of Mr. George Heaton's views of friction and balancing, illustrated as they were by numerous models which could not fail to convey to the minds of all present the most decided conviction of the truth of the statements which were made, and the important deductions derived from them. A lecture of more practical value, we are convinced, has seldom, if ever, been given within the walls of the institution; and the approbation manifested, as the lecture proceeded, by so many eminent machinists as were present, could not fail to be highly gratifying to Dr. Melson, and stimulative of his valuable exertions. The inclined plane, the wedge, and the screw, were first discussed, and their principles of equilibrium developed. After which, having made some preliminary observations on the roughness and extent of surface, the weight to be moved, the nature of bodies, velocity, and the kind of motion, as forming important elements in the consideration of friction, the lecturer observed, that proper width of bearing was essential in an economical point of view, as preventive of that rapid decay of machinery which must otherwise occur. In corroboration of this fact, an instance had been related to him some time ago, by Mr. Heaton, of the wheels of a locomotive engine working on a tram-way between Pontypool and Newport about ten years ago. These wheels were 4 feet in diameter, and only $\frac{7}{8}$ths of an inch in width on the face, and were made of cast iron. The consequence of such a narrow bearing was, that the wheels would, in a fortnight's regular work, wear away from 4 feet diameter to 3 feet 7 inches, being covered on their bearing surface with small loose particles of iron, in flakes similar in size and thickness to the scales of small fish, which was the general appearance wheels assumed when much trod away by friction. As it was of the greatest importance, in a practical point of view, to prevent friction as much as possible, Dr. Melson said he should offer no apology to the number of practical machinists, by whose presence he felt himself so much honoured, for presenting them with certain detailed observations which from time to time he had heard Mr. Heaton make, and in which he fully concurred. Friction, then, might be diminished by applying proper materials in the construction of axles, and the bearings on which they had to run; and by neglecting this important consideration the wear-and-tear in machinery might be indefinitely augmented. Nor was it enough to know, with reference to any individual article, as for instance of brass, that a spindle placed upon a bearing of brass was the best practical method of diminishing friction; but the quality of the brass itself was also an item of the greatest importance. Thus, let an iron spindle, having two necks or journals, carrying a wheel or other machinery giving a pressure of 200 lbs. upon every square inch of bearing surface on the journals, be made to rotate 200 times per minute, upon bearings of such brass as is used in the manufacture of pins, (soft brass,) and to be worked ten hours a-day, the necks of this spindle will require a lubricating material to be applied three times a-day, or oftener, and will, after all, require a new brass at the end of twelve months. If instead of the soft brass, the hard white button brass were used, half the lubricating material would suffice, and the bearings would last twice as long. If now the neck of the spindle were steeled and hardened, once a day would suffice for oiling the journals, and the brass bearings would last for five years; thus not only saving so much brass and oil, but the hard substances rubbing together, having less friction, would require less force to drive them. Dr. Melson here stated, and showed clearly, that although the neck of a spindle running upon a moveable bearing upon friction wheels had less friction, yet in practice these wheels were not so valuable as in theory they appeared to be. Not only was the spindle, in fact, rapidly trodden away, but by the springing of the iron or other material of which the friction-rollers and the spindle were made, although the resistance caused thereby was thought to be very minute, yet, in practice, when these cylindrical bodies were pressed together by a heavy weight, the resistance was very considerable, so much so that by the continual springing of the metal it might be shown that the spindle was, in point of fact, continually running up an inclined plane. Dr. Melson having shown how the wear-and-tear of friction wheels may be experimentally illustrated, and how necessary it was for the contrivers of machinery to provide for the effects of friction, unless, indeed, they would have what seemed so per-

fect in the form of models and drawings, turn out useless in the attempt to bring them into action, proceeded to the subject of *Balancing*. The position which he was prepared to maintain at the outset of this part of his subject was the following:—There is not among machinists sufficient care taken to construct all revolving machinery as nearly as possible in balance. This would appear in a more striking point of view to be of importance, when it was seen, as he was now prepared by models to prove, that inattention to balancing diminished according to a certain function of velocity, the power; and originated, in the second place, so much destructive, dangerous, and at all times disagreeable rocking and agitation in machinery. And, first, deficient balancing produced diminution of power. Here Dr. M. described the crank, and particularly the double crank, with its connecting rod—stating its use in converting an alternate rising and falling motion into a rotary one, as in the locomotive engine, and *vice versâ*. He now took into his hand a model of a locomotive crank-shaft, and showed how difficult it was to make it revolve above once or twice with the greatest force he could exert upon it by his fingers. This done, he took up one exactly similar, but having a counterpoise to each crank, and by the same force it performed with ease several revolutions. The lecturer next ran a rod of brass into the head of a running capstan, and having placed the brass rod so as to project equally on each side of the head, caused it to revolve by means of a six-pound weight; it continued to revolve for 46 seconds, and performed in the time 241 revolutions, as read off on a counter. He next put the rod all out on one side, and all other things being equal, the rod revolved only 30 seconds, and performed only fifty revolutions. These experiments proved the position that inattention to balancing involves a decided loss of power. Experiments were next instituted to show that under these circumstances an increase of power may not only be thrown away, but that such an increase will absolutely tend to diminish the velocity. A three-pound weight caused a model out of balance to revolve longer and perform more revolutions than a six-pound weight. This brought the lecturer to his second position, viz., that deficiency of balancing will create a rocking motion and an agitation of the machinery which will be greater or less as the want of balance is greater or less. It was in the year 1810, whilst Mr. Heaton was employed at Combe Abbey, by the late Earl of Craven, in a part of his lordship's establishment kept for the amusement of himself and his visitors in the practice of mechanical pursuits, as turning, sawing by circular saws, ornamenting by the aid of rose engines, &c., the covers of snuff boxes and other fancy articles, that, finding his hand power insufficient, his lordship determined to have a small steam-engine erected of sufficient power to drive the lathe, &c., at the requisite speed. The engine having been put up, his lordship and many of his visitors were surprised to find that when one of the lathes was urged to a speed of about 600 revolutions in the minute it began to shake, and shook to such an extent as the speed was augmented as to raise the whole lathe and frame from the floor upon which it was placed. Mr. Heaton was, of course, consulted as to the cause of this agitation, and he attributed it unhesitatingly to the fact that the revolving parts of the machine, the pulleys, were not equal in weight on both sides of the centre. The lathe was of beautiful workmanship, made by one of the best makers in London, and the pulley suspected of the fault was made of rosewood, on which was fixed a dividing-plate. Now, it was probable that the texture of the wood being closer on one side than on the other when *dry*, was the cause of this inequality in the weight. Mr. Heaton had immediate instructions to remedy this defect if possible, and he accomplished it in the following manner: —He bored a hole on the light side of the pulley $3\frac{1}{2}$ inches from the centre, and introduced into it nine ounces of lead, which was the quantity required to make the pulley perfectly in balance. The lathe was now again set to work, and at a speed of 600 revolutions per minute, or any other speed requisite for its work, it was perfectly free from shaking. This rocking motion was now illustrated on a large model, whose axis was of the breadth of the ordinary railway gauge, and its two revolving rods of the length of the diameter of the wheels of a locomotive engine. Being unequally balanced, and made to revolve by a weight of six pounds, it exemplified the rocking motion of the lathe. The same motion, Dr. M. observed, may also be noticed in some of the guide pulleys that are heavy-sided on the railways, where a rope is used to draw the train along, particularly when the train runs fast. Here several corrections of machinery, both of lighter and more ponderous construction, were severally detailed, in which Mr. Heaton had succeeded, by attention to this principle, in producing an equable motion, where before the most violent and unaccountable agitation had prevailed. One striking instance occurred in the latter part of last year: an application was made to the firm of Heaton Brothers, Shadwell-street, for instructions to remedy

the evil attendant upon the working of a fan used for the purpose of creating a blast for melting iron; this fan had been set to work, but the steam-engine by which it was driven was found incapable of getting it up to the required speed, which was about 1,000 revolutions per minute, and when it approached that speed it shook the whole of the buildings, and shook itself loose from its bearings. To obviate this position of affairs, the proprietors removed it into another position, and propped it with strong timbers, which strong timbers had their bearing under a heavy wall. When again set to work it shook the whole place as before, and made so much noise, that the proprietors were threatened with a prosecution for nuisance. At this critical juncture of affairs, Messrs. Heaton, having been consulted, immediately took the fan to pieces, and found it 2lbs. 8ozs. out of balance. The evil was rectified, and the fan restored to its former position, short of the whole of its props, &c. The engine was now set to work, and was found capable of driving the fan the requisite number of times, the nuisance was removed, and the fan had never since displayed any disposition to move from the place where it was set. Here an important observation was made, to the effect that the outside of the wings of this fan, which was three feet in diameter, when running at 1,000 turns per minute, does not travel quite twice as fast as the rim of the wheels of a railway train when the train is running at the speed of thirty miles an hour. The motion of the fan was now imitated on the large model, in which experiment the weights on the outside of the steel rods were not propelled at the rate of fifteen miles an hour, although the effect was so violent; whilst, at the same time, the weights travelled at a uniform speed in each part of their revolution. This was not the case with the wheels of a railway train; for if a train were travelling at the rate of thirty miles per hour, the top part of the wheels would, of course, have a much greater motion than the centre. If, then, such an effect were produced by the model, when only twelve ounces out of balance, and only moving that twelve ounces at the rate of fifteen miles per hour, what effects were we not prepared to expect from a railway wheel thrown forward at four times the speed, and where, as in many instances was the case, the wheels were each four times that much out of balance. Dr. Melson now exhibited a model of the locomotive crank shaft and wheels, one inch to the foot, and made it revolve; when the revolution of the wheels became rapid, it shook the board upon which it was placed with comparative violence, and rocked itself from one side of the box upon which the experiment was performed to the other. Next the cranks were counterpoised by weights placed opposite each crank in its nearest wheel, and the same velocity having been communicated to its revolutions, it revolved rapidly without the slightest perceptible agitation. Now, to show that it was not merely the increased momentum in the revolving wheels which gave the model this steadiness, Dr. Melson removed the counterpoises, and substituted larger weights in their place, and the first condition of agitation was produced even more powerfully than before. Similar, and equally convincing experiments were now performed on the large model. To show that these pitching and rocking motions were the identical motions communicated to railway trains, when running at a high velocity, and that the observations he had made were loudly called for by the circumstances attendant upon railway accidents, Dr. Melson now proceeded to give an elaborate series of references to the newspaper accounts of the inquests held on the bodies of the sufferers from the accidents which occurred on the Eastern Counties Railway, June, 1839, and August, 1840; and on the London and Brighton Railway, in October, 1841. From this evidence, it was seen that the rocking motion preceded in every instance the accident; that it was produced by augmented velocity; that the rails were perfect before the accident; that indications of lateral pressure were clear and unquestionable; that there is the same rocking on the Great Western Railway; that the opinions given by the different engineers fell short of the explication of the cause of the accident; and that many were, in short, opinions of little or no value; that there is a great difficulty, after all, in getting at the truth in these cases; and that one of the witnesses, in one case absolutely saw the engine leap up, and alight off the rails. The report of the officers of the railway department for 1842 was next as carefully examined, and it was found that the sentiments of Brunel, Professor Barlow, and Sir F. Smith, as therein embodied, went to confirm the evidence given at the several inquests, and to prove that the causes were yet doubtful which originated the oscillatory and pitching motions that preceded the accidents. The pages of the report particularly referred to were, 70, 71, 72, 76, 145, 194, 195, 203, &c. Immediately after the occurrence of the accident on the London and Brighton Railway, Mr. Heaton addressed to the *Times* the following letter, which, however, was never printed, and which has never yet been before the public.

"*Railway Accidents.*

"*The Rocking and Jumping of Locomotive*
"*Engines.*

"To the Editor of the *Times.*

"Sir,—Seeing in your valuable publication accounts of various accidents on the railways, I find in several instances the accident bas been attributed to tbe engine having acquired a rocking and jumping motion, and, in consequence, running off the rails. To prevent this, some of your correspondents advise the use of six-wheeled engines; such being by tbem considered safer (but in this I do not agree) than the four-wheeled engines, and not so liable to the rocking and jumping motion. I think tbe cause of the complaint exists in some of each sort, and as much in six-wheeled engines as in four-wheeled ones; and that cause being the unevenness in weight of some portions of the machinery—(I mean the crank shaft and appendages;) and considering that any arrangement of machinery that would secure steadiness of motion, and render accidents less frequent, would be of public utility, is my apology for troubling you with this communication.

"In the year 1831, myself and brothers constructed a locomotive engine for the common road. We found, in our first experiment, when we run the engines, (which were of 12 inch stroke only,) at from 160 to 180 strokes per minute, (which, by tbe arrangement of our machinery we were enabled to do,) the jumping and rocking motion was so great as to preclude the possibility of keeping our seat upon the engine; being aware that this motion could only be produced by some portions of our machinery being out of balance, we placed a compensating weight opposite each crank, and repeated our former experiment upon the same road, and found we attained greater speed with no greater consumption of fuel; and the machine travelled perfectly steady at any speed, and free from any symptoms of rocking or shaking. Knowing that this same evil existed in locomotive engines on railways, I constructed, in tbe summer of 1838, a model of a crank-shaft and wheels of a locomotive engine, (to a scale of 1 inch to the foot,) and in the month of October, in the same year, I delivered it into the possession of the then resident engineer of the London and Birmingham Railway, at Birmingham; a description of which was published in the *Mechanics' Magazine* of April, 1839, of which the following is a copy:—

'*Lateral and Oscillating Motion of Locomotive Engines.*

'Sir,—My attention having been drawn to the lateral and shaking motion of engines upon railways, and believing it to be in proportion to the weight of the cranks and gearing, and the position in which the outside cranks, if any, are placed, I made a small model of the engine-crank shaft, with two wheels upon it, in the proportion of 1 inch to the foot, which I placed upon two strong upright wires, the wires having been made fast in a piece of board. I attached a weight to a string wrapped round the middle of the crank shaft, for the purpose of giving a certain degree of velocity to the crank and wheels, by falling a certain distance, and then being released, say from the table to the floor. The momentum or speed thus attained was sufficient to keep the crank shaft and wheels in motion seventy-five seconds, and the swing of the cranks produced a lateral and oscillating motion sufficient to cause the model to move, or jump across the table upon which it was placed. I then placed a weight on each wheel sufficient to balance the crank, and with the same weight to give motion, and travelling the same distance as in the first case, gave sufficient momentum to keep the crank shaft and wheels, although heavier than before, ninety seconds, and tbe model stood steady where it was placed upon the table.

'I submitted my experiments to tbe engineers of the London and Birmingham Railway, who, instructed by the directors, ordered one of the company's engines, (the Brockhall, at that time under repair at Mr. Middleton's, the Vulcan Iron Foundry, Birmingham) to have balance weights applied to it, according to my plans, and under my superintendence. The engine, when set to work with balance weights upon the wheels* had one uniform steady pull at its work; the side sway was gone; it ran equally steady, whether it made 6 or 160 strokes per minute, which is not the case with railway engines generally, for the greater the speed, the greater the snatching and swinging motion. After the engine had worked seven weeks, and had acquired the reputation of a very steady engine, I, with the consent of the engineers of the railway, removed the balance weights from the wheels, and found the same snatching and swinging motion with this engine as is common to all locomotive engines of the usual construction. I found that the engine, when running at or upwards of twenty-two miles per hour, would advance and recede from and to the tender from three-quarters of an inch to an inch every stroke of the engine, and proved the advantage of the balance on the engine equal to the effect on the model. Persons acquainted with railway locomotives will, from the foregoing statements, readily see the great and many advantages to be derived from so simple and yet so effective an arrangement.—Yours, respectfully,

'GEORGE HEATON.

'Shadwell-street Mills, Birmingham.'

"Since that time, some of the most celebrated manufacturers of locomotive engines have added to their engines balance weigbts, fixed in the wheels in so neat a manner as scarcely to be noticed, particularly by persons not mueb acquainted with this description of machinery. Whether the engine which caused the accident on the Brighton Railway, or the one that made tbe rails into tbe form of a snake on the Eastern Counties Railway some time ago, had balance weights or not, I do not know, but from the description of the accidents, as given in your publication at the time, I should say they had not. Why locomotive engines should continue to be made, and used, (and I know

"* Weighing one hundred and eighty-four pounds, fixed 22 inches from the centre."

they are,) without paying particular attention to this subject, is a matter of surprise to me, when the cost of the necessary appendages to balance the cranks, connecting rods, &c., would not, in the manufacture of a new engine, exceed forty shillings. Why this important feature in mechanics should be neglected by railway engineers is astonishing, as it must be known to them that it is particularly attended to in all other kinds of machinery; and even by themselves, when turning these same cranks for the locomotive engines in the lathe, at their manufactory, a balanced weight is used to make them run steady during the operation. To further illustrate the necessity of great care in this department of the science of mechanics, I will instance the simple machine used for the purpose of grinding the points of pins: this is composed of two discs or pieces of steel, about 6 inches diameter, and weighing about 12 pounds each; they are fixed upon a thin spindle or shaft, and require to be propelled round at about 3,500 times per minute. These mills or discs are always set out of truth with each other, but require to balance each other so nicely, to determine their resting steady in their journals, that one-twentieth part of an ounce out of balance with each other would render the machine unsafe to the workman, being liable to jump from its bearings, and unfit for use. The outside of the discs (or 'mills,' as they are called by the workmen) travel but little more (if so much at times) than double the speed of the locomotive engines—say 5,250 feet per minute, or nearly sixty miles per hour. The cranks of locomotive engines (with wheels of 5 feet diameter, and stroke of piston 18 inches) travel, when conveying a mail train, at about one-sixth, and sometimes at about one-fifth, of the speed of the outside of the pin mill, and are about (including the connecting rods, brasses, cutters, &c.) one hundred and eighty pounds out of balance, and, when the train is going at the rate of thirty miles per hour, has to swing round from 180 to 200 times per minute: these cranks being at right angles, and some distance from the axis of the engine, one on one side and the other on the contrary side of the axis, swinging round at such a pace, is, in my opinion, the cause of the rocking motion. The engine running for some time at one uniform speed, and at a high velocity, the springs are acted upon by the unevenness or swinging of the cranks, connecting rods, &c., until the springs and cranks keep time with each other, when the jumping motion commences, and at every stroke of the engine is increased to a great extent, and if the speed cannot be immediately seriously altered, (which is found impossible with a heavy train,) the engine will, in spite of all other efforts to prevent it, jump off the rails.

"Yours respectfully,

"GEORGE HEATON.

"Shadwell-street Mills, Birmingham, October 23, 1841."

Dr. Melson concluded by referring to the fact that the compensation principle was already beginning to gain much upon public favour; that on the Birmingham and Manchester (Crewe) Line such engines were universally adopted, and that on several of the lines there were individual engines of this character. The straight-axled engine is decidedly superior to the other, but here the evil obtains, inasmuch as the crank-pins and connecting rods are not compensated.

NEW STEAM FRIGATE—THE LARGEST IN THE WORLD.

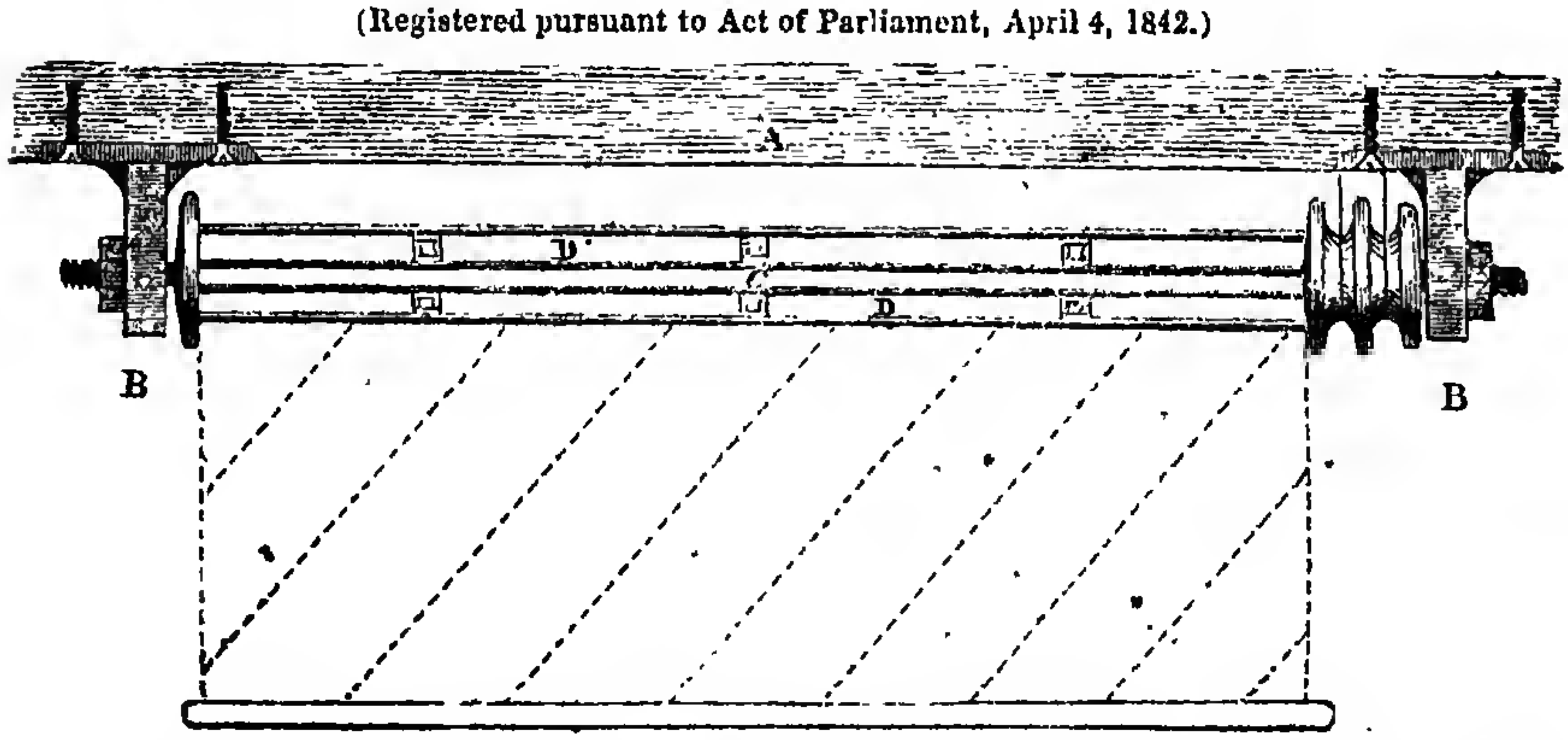
The Admiralty have given instructions for the building and equipment of a new steam frigate, which is to surpass, in size and power, every thing of the kind yet afloat. She is to be of 650 horses power; to have engine room for 600 tons of fuel; complete stowage under hatches for one thousand troops, with four months' stores and provisions, exclusive of a crew of about four hundred and fifty men; and is to be armed with twenty guns of the heaviest calibre, besides carronades. The *Cyclops*, *Gorgon*, *Geyser*, and other war steamers now talked of as wonders for magnitude, will sink into insignificance as compared with this; the largest of them will be little more than half her size. For the sake of greater expedition she is to be made out of one of the large class frigates lately built (the *Penelope*, cut into two, with 55 feet in length 44) added. The originator of this plan is John Edye, Esq., the able assistant surveyor of the Navy, (well known to all naval architects for his invaluable work on the "Equipment, Displacement, &c., of Ships, and Vessels of War") and she is to be completed at Chatham Dockyard, under his immediate superintendence and direction. The engines are to be on the Gorgon plan, and the commission for building them has been given to the inventors of that plan, Messrs. John and Samuel Seaward. The vessel is expected to be fully completed, and ready for sea before the close of the present year.

The conduct of the Government in

this matter—conduct alike admirable for its vigour and promptitude, is—under the existing circumstances of the country, of a nature to give very general satisfaction. By nothing can such disasters as have lately befallen our arms in the East be so effectually repaired, or their recurrence more certainly prevented, than by the fitting out of a few such leviathans of war, as that which we have now described as being in progress. With half a dozen ships of this force at command—6,000 men might within three weeks from the first receipt of the news from Affghanistan, have been landed at Alexandria—marched in six days through Egypt (with leave of its Viceroy,) to Cosseir, on the Red Sea—and transported thence in nine days more to Kurrackee on the south coast of Scinde. With such a force there is hardly a corner of the world which British thunder could not reach in early time enough to uphold, against all opposition, British influence when linked in honourable alliance with the interests of human civilization and happiness (may we never know any other!) It is, moreover, a simple mechanical fact, which admits of no denial, that Great Britain can show forth a power in this way (thanks to her mechanics! thanks to her workshops! thanks to her *practical* science!) which no other country in the world can at all approach, far less rival. Every year, for the last half dozen, has witnessed some *paper* decree for the formation of a French steam navy, with engines of 300, 400 and 500 horse power, but where are they? It is notorious, that *all France* has never yet been able to produce an engine, good for anything, of more than 200 horses power. Were such an order, as has been just given by our Admiralty for a pair of 325 horses power each, to be furnished in nine months, to be given by the French government to French manufacturers, it could not be executed (if at all) in as many years.

WHEELER'S IMPROVED ROLLER FOR WINDOW-BLINDS.

(Registered pursuant to Act of Parliament, April 4, 1842.)



The novelty in this roller consists in its being constructed of such materials, and in such manner, that it may be of any length required, without being heavier than one of the common width, and without its being liable to bend or droop in the centre. It is particularly applicable, therefore, to very large windows, such as those of shops, churches, halls, &c. The prefixed drawing is a representation of one of no less than 20 feet in length, which has been fitted by the inventor (Mr. Charles Wheeler, of Speenhamland, Newbury) to the shop-window of an extensive draper. The construction will be readily understood from the following description.

A is the brestsummer.

B B two strong brackets secured to the brestsummer.

C is a ¾-inch iron pipe, enclosed in a cylinder, D, and resting by its extremities in the brackets, B B, the parts outside of the brackets being screwed for the reception of two strong nuts.

D, the outer cylinder, may be made of wood, or tin, or any other suitable light material; and between it and the iron pipe vertical stays are placed at intervals, (as represented in the engraving,) for

the sake of greater support and security. At one end are two pulleys, by which the blind is raised and lowered, by means of lines passing from them under the cornice, down to a windlass in the inside of the shop.

By screwing tight the nuts on the ends of the iron pipe, C, that pipe can always be kept in a perfectly horizontal position; and as long as it remains so, the wooden, or tin cylinder which incloses it, and on which the blind is wound, will remain equally so.

When the blind is entirely up, the whole apparatus is concealed from view by a face-board (not shown in the drawing) which may be made of any suitable ornamental form.

HINTS ON VALVES—MESSRS. MAUDSLAYS AND FIELD'S PRACTICE.

The quantity of lap or cover proper to be put upon valves, is a question determinable altogether by the quantity of expansion required, and varies in different engines of the same power. But the upper and under faces of the valve are, in Messrs. Maudslays' (side lever) engines, in no case of the same breadth: the cause for this inequality is that if the valve be at half stroke, that is, with both ports closed, and if the engine be moved round, the travel of the valve from half stroke to the extremity of the stroke *downwards* will be found to be not the same as the travel of the valve from half stroke to the extremity of the stroke *upwards*. In other words, the space described by the valve whilst the piston descends, and the space described by the valve whilst the piston ascends, *are not equal;* whereby it becomes necessary to make the superior and inferior faces of the valves of different depths, to compensate for this inequality. The accuracy of the preceding statement every engineer has it in his power to verify, either by a model, or by a drawing of the valve and piston in their several relative positions. The cause of the irregularity may be traced to the oblique action of the connecting and eccentric rods. If the piston be placed at half stroke, that is, midway between the top and the bottom of the cylinder, the crank will not be level. This is manifest from the ordinary method of ascertaining the length of the connecting rod, which is to level the beams, and take the vertical distance from the extremity of the beams to the centre of the crank shaft. When the beams are level the engine is at half stroke, but if we wish to attach the connecting rod to the crank pin—its length being ascertained as above—it will be necessary to bring the crank down a little, to compensate for the depression of the head of the connecting rod due to the deviation from the vertical line. If, then, the crank be not level at half stroke, the descent of the piston from half stroke, and its ascent to half stroke again will accomplish *more* than half a revolution of the paddle wheels; and the ascent of the piston from half stroke, and its descent to half stroke again, will accomplish *less* than half a revolution of the paddle wheels. The ratio of the disparity will vary with the length of the connecting rod, the circumstance of there being overhang or no overhang of the beam, the length of the beam, and other circumstances; but in all ordinary engines, the difference between the upper segment of the circle of the crank's revolution and the under segment of that circle will interfere with the valve's motion, and the proportionment of the valve faces ought to have reference to the extent of that interference.

It is Messrs. Maudslays' practice in some of their very recent engines, to make the stroke of the valve considerably more than twice the depth of the port. All the valve levers are equal, and the stroke of the valves is in all cases equal to the throw of the eccentric. It is also their invariable practice, in all engines of considerable magnitude, to construct the valve casing with a faucet joint, to permit the expansion of the casing when heated with steam, without distorting the cylinder. In some large engines which have been without this provision, we have known the cylinder ports to be rent asunder by the expansion of the casing; and however frequently and however well the rust joints of the casing might have been made, they invariably became very soon leaky, from the effect of unequal expansion. The cylinder when hot will expand as much as the valve casing; and if the two were always equally heated, no detriment could ensue from the absence of an expansion joint. But as the throttle valve is never perfectly tight, and as the slide valve generally is so, the steam before the engines are started enters the casing and induces its expansion; whilst being excluded by the slide valve from the cylinder, the cylinder is not heated, and therefore does not expand. Injury of some sort or other, if the engine be large, is sure to be the result of these conflicting forces.

In the double cylinder engines of Messrs. Maudslays, cylindrical slide valves are employed, and have been found to operate extremely well. The packing of these valves is metallic. The packing of the pistons made

by the same firm are invariably metallic, and generally consist of a single ring turned eccentric, cut in one place, and the cut part fitted with a tongue piece to prevent the steam from passing through the cut. A piece the same breadth as the ring is fitted over the back of the cut, ground tight, and then riveted to one part of the ring. The elasticity of the ring is in most cases found sufficient to keep the ring in intimate contact with the interior of the cylinder, and the force with which this contact is maintained, may be either augmented or diminished by a bridle. — *Civil Engineer and Architect's Journal.*

WALKER'S HYDRAULIC ENGINE.

Sir,—I am sorry that the use of the term *cylinder*, in the description of "Walker's Hydraulic Engine," in No. 971, should have misled your correspondent, "A Builder;" but if he had referred to my previous communication on this subject, I think this could not have happened, and therefore I hope he is single in this misconception: in his case, seeing for himself has put all right.

With reference to the omission charged upon me, respecting the very ingenious valve which Mr. Walker has adapted to his machine, my apology is twofold. Firstly, I was desirous of calling the attention of your readers, simply to the general principle of the machine, without any reference to constructive details; because, as the thing is still (in this point of view) in its infancy, every day brings forth some improvement in the minutiæ of the mechanism. And, secondly, the improvement in question did not exist at the time my paper was written.

The shipping interest is, as "A Builder" observes, deeply interested in this invention. Wherever water has to be raised under circumstances which produce a liability in ordinary pumps to choke, or to wear rapidly, Mr. Walker's machine can be employed with pre-eminent advantage.

In water containing large quantities of sand or gravel, this is the only *elevator* that can be used for a continuance.

Mr. Walker has already been applied to for a machine to raise some sandy water which has disabled the best pumps that could be procured, in an hour; and the failure of every pump that has hitherto been tried (Shalder's "wonderful" included) has compelled the suspension of the work. There is no doubt that Mr. Walker's machine will speedily surmount this difficulty, and enable the work (which is of the first importance to the maritime world) to be completed without any further delay.

From what has been already accomplished, it seems pretty evident that wherever ordinary pumps can work, Mr. Walker's machine will beat them in the quantity of work done with a given power; and that under circumstances rapidly destructive to all other machines, that of Mr. Walker will continue to perform its functions uninjured for an indefinite period. I remain, Sir,

Yours respectfully,
WM. BADDELEY.

29, Alfred-street, Islington,
April 4, 1842.

MERITON'S SLIDE-VALVES.

Sir,—My attention has been drawn to a letter which appeared in your Magazine of the 19th of March, written by Mr. T. Meriton, of MillWall, and accompanied with five views of an improved slide-valve.

The advantage of this valve is stated to consist in giving steam quicker than the common D valve; and this we may perhaps allow, providing it can be first shown that it will answer at all. The slides, he says, would only require to travel $\frac{1}{10}$th part of the distance of the D valve (still sticking to the same valve) but I would remind Mr. Meriton that there are other sorts of valves beside the D valves, which would also require only $\frac{1}{10}$th of their travel, such as double beat, or equilibrium valves.

We are further told, (and to this point I would direct the special attention of your readers) that it does "away with a deal of work, such as the D valve, jacket packing, blocks, &c." Now, in the first place, it must appear evident to any person who looks candidly into the matter, that, to keep a ring steady, such as Mr. M. intends to make use of for a slide, there must be at least three valve-spindles at the top, and three at the bottom, so that we should have not less than seven steam-tight stuffing-boxes immediately connected with the cylinder! Every engineer knows that the D valve, together with the cylinder, would only require two. Then again, there is the labour and expense of casting a cylinder with four small passages round it; indeed, I feel rather doubtful whether it would be possible to do it. So much for the dispensing with "a *deal* of work!"

But what surprises me most is the blunder which Mr. M. has made in his intended application of a metallic ring for a slide. This ring, from Mr. M.'s explanation, I understand to be one of cast iron, or brass, turned true, inside and out, with one side thinner than the other, so that when it is cut in two at the thinnest side, it has a tendency to fly open, and press with its rim against the sides of

the cylinder. It appears to be on the same principle exactly as the piston-rings now pretty generally adopted by engineers. Now it is evident that if a ring of this description be applied to the ports in Mr. M.'s cylinder (and your readers will oblige me if they will just turn to that gentleman's sketches) the steam will act continually against its rim, and force the two thin ends close together; which must consequently make the ring less in diameter than the bore of the cylinder, and admit the steam, whether it be required or not. I am, Sir,

Yours, &c.,

D.

ON PARACHUTES.—BY THE LATE BARON MASSERES.

(From the MS. collections of the late Dr. Olinthus Gregory.)

1. If a cylinder of lead, or wood, or any other substance heavier than air, falls perpendicularly downwards through the air with its base, or flat side, foremost, or so that its axis shall always be perpendicular to the horizon, and the number of inches in the axis or height of the cylinder be denoted by the letter a, and p be the number which bears the same proportion to 1 as the specific gravity of the cylinder bears to the specific gravity of air, the greatest velocity which the cylinder can acquire by falling in this manner through the air will be such as will carry it through $\sqrt{384\,p\,a}$ inches in a second of time. This I have seen demonstrated.

2. As an example of this, let the height of the cylinder be 3 inches, and its specific gravity the same as that of water, or 860 times the specific gravity of air. Then we shall have $a = 3$, and $p\,a$ ($= 860 \times 3$) $= 2580$, and $384\,p\,a$ ($= 384 \times 2580$) $= 990, 720$, and consequently $\sqrt{384\,p\,a}$ ($= \sqrt{990,720}$) $= 995$ inches. Therefore the greatest velocity that can be acquired by such a cylinder in falling in this manner through the air is that of 995 inches, or about 83 feet, in a second of time.

If such a cylinder were 10 feet broad, or the diameter of its base was 10 feet, or 120 inches, the number of cubic inches contained in it would be $\left(3 \times 120 \times \frac{11}{14} \right.$ $3 \times 14400 \times \frac{11}{14} = 43200$ $\left. \frac{11}{14} = \frac{475,200}{14} \right)$ 33,943.

Now every cubic foot of water weighs 62 pounds and a half, avoirdupois, therefore every cubic inch of water weighs $\left(\frac{62{\cdot}5}{12 \times 12 \times 12} = \frac{62{\cdot}5}{1728} = \right) 0{\cdot}0361$ of a pound avoirdupois. Therefore 33,943 cubic inches of water will weigh ($33,943 \times 0\,0361 =$) 1225 pounds. Therefore a cylinder, or parachute, of the same specific gravity as water, and of 10 feet diameter in the base, and 3 inches in height, or thickness, would weigh 1225 pounds. Box wood is heavier than water in the proportion of 103 to 100. Therefore a cylinder, or parachute, made of box wood whose height, or thickness, was three inches, and the diameter of its base 10 feet, or 120 inches, would weigh $\left(1225 \times \frac{103}{100} \text{ or } \right)$ 1262 pounds. And as the difference of this specific gravity from that of water is so small, the utmost velocity which such a cylinder, or parachute, could acquire by falling in the above described manner through the air would be but little more than that of the former parachute, or than that of 83 feet in a second of time. Now let us suppose the height of this parachute of box wood to be reduced from 3 inches to $\frac{1}{2}$ an inch, or $\frac{1}{6}$th of what it was before. Then it will follow that $\sqrt{384\,p\,a}$ will be less than it was before in the proportion of 1 to $\angle$ 6, or or of 1 to 2·44, and consequently wi' be $\left(= 83 + \frac{1}{2{\cdot}44} \text{ or } \right)$ 34 feet in a second of time. And the weight of this last parachute will be $\frac{1}{6}$th of the weight of the former, or $\left(\frac{1262}{6} \text{ or } \right)$ 210 pounds.

Now let the diameter of the parachute be enlarged from 10 feet to 40 feet, and its height at the same time diminished from $\frac{1}{2}$ an inch to the 32nd part of an inch. Then it is evident that its solid contents, and consequently its weight, will continue the same; because its base will be increased in the same proportion of 16 to 1 in which its height is diminished. It will, therefore, still weigh 210 pounds. But the utmost velocity which it can acquire by falling through the air, in the manner above described,

will be less than before in the proportion of 1 to 4, and therefore will be that of $\left(\frac{34}{4} \text{ or } \right)$ $8\frac{1}{2}$ feet in a second of time.

If, therefore, a parachute can be formed of the diameter of 40 feet and of a very small thickness, so that its weight, together with that of a man hanging from it, shall be only 210 pounds, the utmost velocity such a parachute, and the man hanging from it, can acquire by falling through the air in the manner above-described, is that of $8\frac{1}{2}$ feet in a second of time, or about $5\frac{1}{2}$ miles in an hour.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

LOUIS LACHENAL, OF TICHFIELD-STREET, SOHO, MECHANIC, AND ANTOINE VIEYRES, OF No. 40, PALL-MALL, WATCH-MAKER, *for improvements in machinery for cutting cork*. Enrolment Office, March 4, 1842.

Two separate and distinct machines are employed for this purpose, driven by a steam-engine or other suitable power. The first machine cuts the slabs of cork by means of revolving cutters into perfect parallelograms; the machine being so far self-adjusting as to adapt itself to the thickness of the slab whatever that may happen to be. The upper and under bark, or surface of the cork being removed, the parallelograms are fed down a square tube to the other or rounding machine. On reaching the bottom of the tube, the square pieces of cork enter into recesses formed round the periphery of a revolving wheel which regulates their admission to the holders; these holders seize the parallelograms of cork between them, and in revolving, present them to fixed knives, by which they are cut into the shape requisite for use. In order to preserve the fine edge necessary for cutting cork, revolving rubbers, the axles of which are mounted on springs, are kept in contact with the cutting edges of the knives or cutters. These rubbers are composed of copper or other suitable material, into the face of which, fine diamond powder has been driven, by hammering.

The inventors of this machinery have bestowed a great deal of ingenuity and pains upon it, but on the whole, we see no reason to believe that they have succeeded much better than others in overcoming the *economical* difficulties which seem inseparable from all attempts at cork-cutting by machinery. The cunning of the hand will still, we suspect, maintain its ancient mastery in this, as it has done in various other arts, to which machinery has been able to lend no assistance, for this simple reason, that the hand is itself a machine, surpassed by few in capacity and power. The method by which the present patentees propose to keep their cutters in constant working order is not new, the same having been before proposed by an American patentee (see *Mech. Mag.* vol. xxxvi. p. 127) for though the American cork-cutter makes no mention of the diamond powder—as never dreaming probably that it would answer to grind down diamonds to make corks—he claims "the use of emery *or any other substance* which will give an edge."

JOHN JUCKES OF LEWISHAM, KENT, *for improvements in furnaces or fire-places.*—Enrolment Office, March 4, 1842.

An endless chain of moveable furnace bars passes round two wheels, one at the front of the furnace and the other at the back; and this chain is made to revolve at the rate of about three feet an hour, by means of sundry rollers, cog-wheels, pinions, levers, ratchets, clicks, rails, &c., the fresh supplies of fuel being dropped upon the bars from a hopper over the mouth of the furnace, and carried slowly forward into the burning mass, as the chain revolves. The action of the apparatus is precisely similar to that of the well-known dredging machine.

The patentee says, "I wish it to be understood, that what I claim is the mode of constructing furnaces or fire-places by combining fire-bars into a chain, by which the parts may be changed in their position from time to time, and progressively go into and out of action as above explained."

We do not think the patentee runs much risk of his claim being invaded. His apparatus is simply the most complicated and cumbrous of all which have yet been invented, whether for the better protection of fire-bars, or better consumption of fuel; and is of a great deal less promise in point of efficiency, than many others that might be named. Brunton's well known revolving grate, for example, the patent for which has long since expired, and which all the world therefore are now free to use, and may in many cases use with great advantage.

MICHAEL COUPLAND, OF POND YARD, SOUTHWARK, MILL WRIGHT AND ENGINEER, *for improvements in furnaces.* Enrolment Office, March 4, 1842.

Half of the fire-bars are made capable of being lowered and raised by means of an auxiliary apparatus of wheels, screws, &c. alternating with other bars, which lift upwards only, so that fresh supplies of fuel

may be placed on the lowered bars as wanted, and raised into the furnace *below* the ignited fuel.

The claim is confined to the method of feeding furnaces from *below*, by lowering only "*a portion* of the fire-bars;" and rightly so, for a method of doing the same thing by the lowering of the whole of the fire-bars has been already patented (E. Foard, Islington, Jan. 16, 1841,)—a method, too, which is much simpler than that of the present patentee. If a deviation to the extent of one-half be sustainable, why not also one to the extent of a fourth or a tenth, or a hundredth, or a thousandth part of an invention? And where then might a patentee's right be said to *begin?*

JOSEPH MILLER, OF MONASTERY COLLEGE, EAST INDIA ROAD, ENGINEER, *for an improved arrangement and combination of certain parts of steam-engines used for steam navigation.* Rolls Chapel, March 29, 1842.

The "improved arrangement and combination" which form the subject of this patent, apply chiefly to that class of marine steam-engines, in which two steam cylinders, two condensers, and two air pumps are employed; and have for their principal objects saving of space, increased length of stroke, greater stability, &c.

The patentee describes thus generally his invention:—"The improved arrangement and construction consist in arranging the two condensers and two steam cylinders, so that the two condensers being formed in one vessel, with a partition to divide it, the said condenser will fill up all the space between the two steam cylinders, the two air pumps being within the two condensers, and those condensers and steam cylinders applying one and the other with lateral contact, by suitably formed vertical surfaces extending up and down the whole, or nearly whole height of the condensers, and extending an equal height up and down the height or length of the cylinders, so as that the said vertical surfaces of the condensers which are in such contact with the corresponding vertical surfaces of the cylinders, can be firmly united together, each surface to the other, by screw bolts, or other suitable means, in order that all the aforesaid parts, namely, the two steam cylinders and two air pumps, may, by means of the contact and union of such vertical surfaces be firmly united into one combination or mass, whereby each of the said parts will be held and retained in its own intended place by its arrangement and combination with the other of the said parts, without requiring any foundation plates, and without depending materially upon fastening down to the bottom of the ship or vessel for keeping the said parts in place. And though the cylinders will of course be fastened down to suitable sleepers or keelsons as usual, such fastening will be chiefly for the purpose of fixing the whole combination in place in the vessel. The requisite communication between the cylinders and the nosles thereof and the condensers (called eduction passages for exhausting the steam from the cylinders,) are made in the vertical surfaces by the contact and union whereof the cylinders and the condensers are united together, the said eduction passages being at the upper or highest parts of the said surfaces, so as to communicate with the highest parts of the condensers. The lower parts of the cylinders descend into the surfaces between the sleepers or keelsons, to which the cylinders are fastened down, the bottoms of the cylinders being very near to the ceiling of the inside planking, or to the floor timbers of the bottom of the vessel, whereby the whole vertical distance below the axes of the cranks that the depth of the vessel will admit of, is rendered available for giving to the engines as much length of stroke as can be obtained in that class of engines to which this improved arrangement and combination relate. The condensers stand upon, or are fastened down to the sleepers or keelsons, but do not descend so low as the cylinders. The bearings for the axes of the cranks are formed according to the usual mode in cast-iron framing, as is usual in engines of this kind, and is sustained, as usual, by means of upright pillars, affixed to the cylinders by means of projections from the upper flanges thereof; there are four such pillars to each cylinder, serving to keep the cylinder down as well as sustain the bearings."

The inventor illustrates the preceding arrangements by a number of very minutely described drawings, and sums up thus:—

"*And note*, though two distinct condensers, and two distinct air pumps have been described, (that being preferable in most cases,) nevertheless, that is not essential to my improved arrangement and combination, but the same is equally applicable if the condenser is made without the partition, so as to be only one condenser, with only one large air pump, equivalent in its capacity to the two air pumps. And I make no claim to new invention in any other of the parts hereinbefore mentioned, beyond the cylinders, condensers, or condenser and the air pumps or pump; but what I claim, as new invention, is, the improved arrangement and combination before described of the steam cylinders, with the condenser or condensers, and air pumps, or air

pump. The distinctive character of that arrangement and combination being, that the condensers or condenser, are, or is, so arranged in respect of the steam cylinders as to fill up all the space between the two steam cylinders, and so as to join thereto by means of vertical surfaces of mutual contact and union of the condensers or condenser, with the cylinders, which surfaces are held together by a sufficient number of screw bolts, to unite the cylinders and the condensers firmly together; also the air pumps or pump, being either vertical or inclined, and either fixed within the condensers or condenser, or else (in the case of the pumps being inclined, but not otherwise,) those pumps being firmly affixed to the condensers or condenser, by branches as before described, and by these means the whole of the said parts are united as before described, into an improved arrangement and combination, possessing great advantages in respect to simplicity, compactness and union of the said parts."

John Harwood, of Portland-place, in the County of Middlesex, Esquire, *for an improved means of giving expansion to the chest.*—Enrolment Office, April 7, 1842.

The principle on which this invention is founded, is one of unquestionable soundness, namely, that "it is necessary to the due expansion of the chest (on which the healthful action of the entire body depends) that the shoulders should habitually have a backward and downward position or inclination;" and we believe it to be true also, as the patentee avers, that such a habitual position of the shoulders must "contribute essentially to the perfection of the shape and figure of the body, and to an erect and graceful carriage." To accomplish these objects, the patentee provides the shoulders with "certain artificial aids or supports, calculated not only to induce them to assume the proper retracted and depressed position, but to sustain them in such position without painful or inconvenient pressure, or impeding the free action of any of the muscles of the arms, shoulders or back." These artificial supports are composed of thin plates of metal, or other suitable solid substance, covered with leather, or other soft material; or simply of an outside frame of metal or wire, filled in with some soft substance; and they are so curved, or arched, as to fit without inconvenient pressure upon the shoulders. The hind parts are of a large pear-shaped form, in order to present a broad surface of support for the shoulder-blades, over, and upon which they rest, and the anterior parts, which are of a similar shape, but much narrower, come down in front. The shoulder-pieces are connected by elastic bands at the back and front with a waist-band; those in front coming straight down, but those behind crossing each other diagonally (like common braces). The effect of these, and other subordinate arrangements which it is here unnecessary to detail, is stated to be "to impart at once great support to the trunk, and a right bearing and action to all the bones and muscles of, and connected with, the upper extremities, and so to prevent, diminish, or remove, without inconvenience, that stooping and protrusion of the shoulders, of which weakness in these muscles, or distortion of the body, is the usual cause." Again:—"The shoulder-pieces being entirely separate, or only slightly connected together by the back-bands where they cross each other, each shoulder-piece admits of the natural play of the shoulder, which it sustains independently of the other." A further important advantage which these supports possess over all other contrivances of this class which we remember to have seen, is, that they do not require straps, or bands of any kind, to be passed under the arms, where pressure of any sort is not only irksome, but certain to be more or less injurious.

NOTES AND NOTICES.

The Story of the Egg—Columbus Anticipated.—Vasari relates an anecdote of Brunalleschi, similar to that recorded of Columbus, though this has unquestionably the merit of being the first, since it occurred before the birth of Columbus. (Brunaleschi died in 1446, Columbus was born in 1442.) A council of the most learned men of the day, and from various parts of the world was summoned to consult, and show plans for the erection of a cupola like that of the Pantheon at Rome. Brunaleschi refused to show his model, it being upon the most simple principles, but proposed that the man who should make an egg stand upright on a marble base should be the architect. The foreigners and artists agreeing to this, but failing in their attempts, desired Brunaleschi to do it himself, upon which he took the egg, and with a gentle tap broke the end, and placed it on the slab. The learned men unanimously protested that any one else could do the same, to which the architect replied with a smile, that had they seen his model they could as easy have known how to build a cupola.—*Latilla on Fresco Painting.*

Ancient Railroads.—It is generally supposed that the Greeks, amid all their advances in abstract science, were comparatively backward in some of the most important practical arts of civilized life, more especially in all that relates to interior communication by means of roads, bridges, &c. There are, however, many strong evidences, both of a practical and a speculative nature, that under all these disadvantages this branch of internal economy was, according to the use and fashion of the age, carried, even at the remotest period of antiquity, to a much higher degree of perfection in Greece than has usually been supposed. Travellers have long been in the habit of remarking the frequent occurrence of wheel-ruts

in every part of that country, often in the remotest and least frequented mountain passes, where a horse or mule can now with difficulty find a track. The term *rut* must not here be understood in the sense of a hole or inequality worn by long use and neglect in a level road, but of a groove or channel purposely scooped out at distances adapted to the ordinary span of a carriage, for the purpose of steadying and directing the course of the wheels, and lightening the weight of the draught, on rocky or precipitous ground, in the same manner as the sockets of our railroads. Some of these tracts of stone railway, for such they may in fact be called, are in a good state of preservation, chiefly where excavated in strata of solid rock. Where the nature of the soil was not equally favourable, the level was probably obtained by the addition of flags filling up the inequalities. It seems now to be generally admitted by persons who have turned their attention to the subject, that this was the principle on which the ancient Greek carriage roads were constructed on ground of this nature.—*Mure's Tour in Greece.*

New Process of Dyeing.—The *Commerce* announces that the Russian Government had purchased for the sum of 1,000,000 rubles the new process of dyeing blue, by means of which the price of dyeing a piece of cloth is reduced to six francs from thirty-two. M. Casimir Perier, the French Minister at St. Petersburgh, was in treaty with the inventor for the acquisition of his discovery, which would "free France from the tribute which she pays yearly to both Indies for indigo."

Different Effects of Vegetables upon different Animals.—Horses will not touch cruciferous plants, but will feed on reed grasses, amidst abundance of which goats have been known to starve; and these latter, again, will eat and grow fat on the water hemlock, which is a rank poison to other cattle. In like manner, pigs will feed on henbane, while they are destroyed by common pepper: and the horse, which avoids the bland turnip, will grow fat on rhubarb.

The Mat Trade.—The bark of the Linden tree is a great article of commerce in Russia, where it is used to make mats, baskets of all kinds, bags, slippers, and other things, and also for thatching. The trades is carried on to a considerable extent throughout the North East of European Russia, from the Ousha and the Wetugt to Kama, where the lindens grow in great abundance, but do not thrive without the shelter of other trees. It is calculated that upwords of 14,000,000 mats are made annually in Russia, requiring 1,000,000 of trees to be stripped, and creating a traffic to the amount of, at least, 3,000,000 of silver roubles, or more than 12,000,000 francs.

Warmth of the Snow Blanket.—At the French Academy of Sciences, (March 14,) M. Arago read a communication on the warmth imparted to the earth by a covering of snow, and respecting which there has hitherto been much scepticism. M. Arago stated that M. Boussingault had ascertained the truth of the theory beyond the possibility of doubt, during the past winter. He found that a thermometer plunged in snow to the depth of a decimetre (about 4 inches) sometimes marked 9 degrees of heat greater than that at the surface.

England's Destiny.—"I do not know, in the history of the world (says Frederick Von Raumer, in one of his recent works), a more noble destiny than that to which England is called, which she has already accomplished, or will infallibly accomplish in due time. The great projects of Alexander fell to the ground at his premature death; Rome established her power by the sword alone, and the destruction of other nations, and she perished in the sequel by her own fault, of a long protracted disease. Mahometanism, in relation to Christianity, was a deplorable retrogression, and the empire of Napoleon only a meteor of arrogant tyranny. The Papal dominion of the middle ages had an eternal value for the education of the human race; but it extended at that time only to Europe, and fell into numerous errors. The errors, however, are not the essence; and this essence will survive all the tricks of political mountebanks. England is the first empire, which embraces the whole earth, every nation; yet the chief weight and the chief value are not in the extent of its dominions, but in the highest activity, united with progress in the sciences, and the most laudable solicitude for the spread of religion. England is the intellectual eye which turns to every quarter, penetrates through every zone, and prepares an exalted future destiny for the human race. Before this noble, comprehensive, glorious destination, the low and violent disputes of domestic parties lose all their importance, or are but shadows that relieve the higher lights."

Logan Rock Replaced in its Former Position.—This great lion of the west, after being kept for the last several years by means of chains and props, from falling off the rock on which it stands, is once more brought back to its former position. It appears that it had been gradually wearing away the part on which it stood, until it had become a foot distant from its own basis. By the ingenious adaptation of four screws, however, invented by James Treguitha and J. Hutchens, of the village of Treene, they succeeded in forcing back the rock to its original place, and it may now be moved with greater facility than before, and equal safety.—*Cornwall Gazette.*

Disc Hydraulic Engine.—We have been gratified with the inspection of a very complete hydraulic apparatus, constructed on the principle of the disc engine, by the Birmingham Disc Engine Company, and impelled by a steam-engine on the same principle. The engine, boiler, and hydraulic apparatus, are all contained in a small canal boat measuring 50 feet in length, and 7 feet in width. The engine and apparatus, without the boiler, occupy a space of only 12 feet by 6 feet. When we inspected this machine, it was drawing water from the canal, and delivering it at a height of 5½ feet, through a pipe of 20 inches diameter, which was filled "full bore," and the delivery of the water was almost perfectly uniform. We understand that the quantity of water raised has been ascertained by measurement, and found to be equal to 4,000 gallons per minute, or nearly 40,000 cubic feet per hour. This apparatus has been constructed for one of the canal companies, to be used for emptying the canal, when requisite for repairs.—*Midland Counties' Herald.*

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THE DRUMMOND DOMESTIC LIGHT.

Fig. 1.

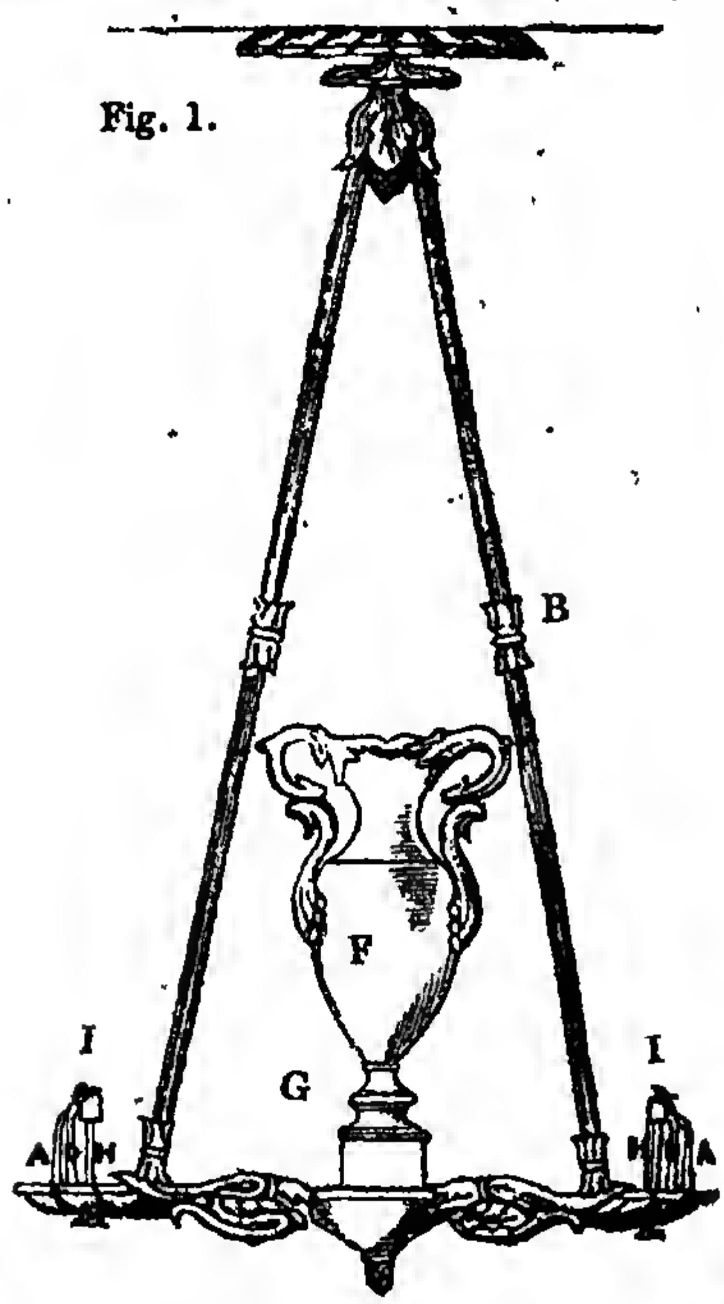


Fig. 2.

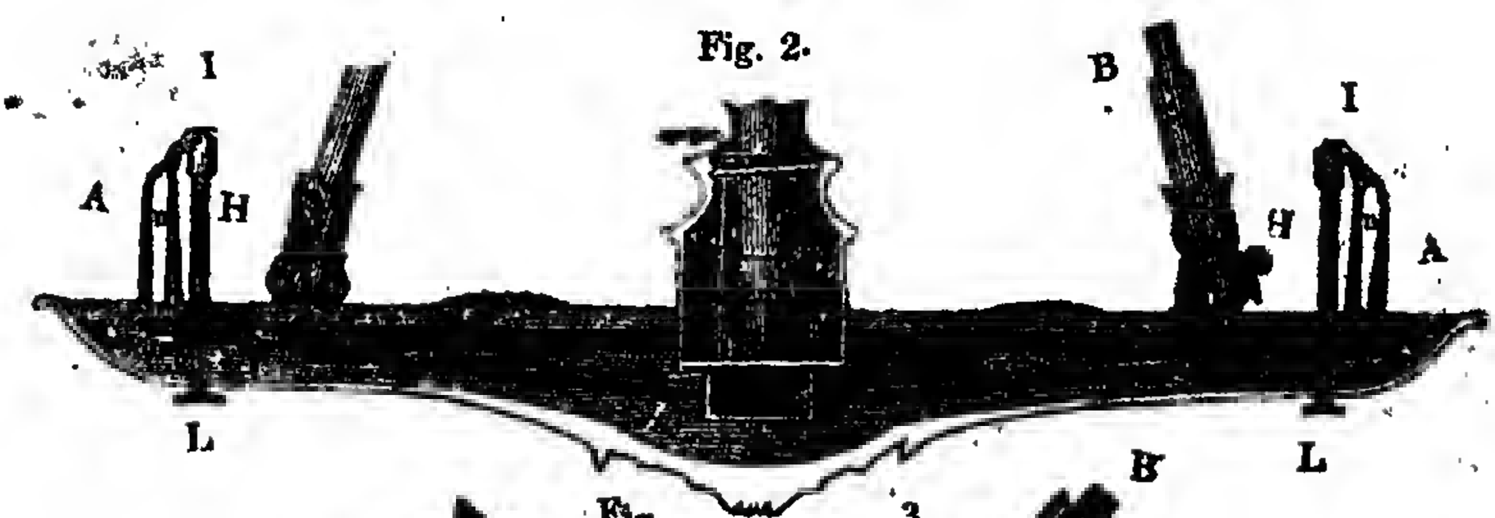
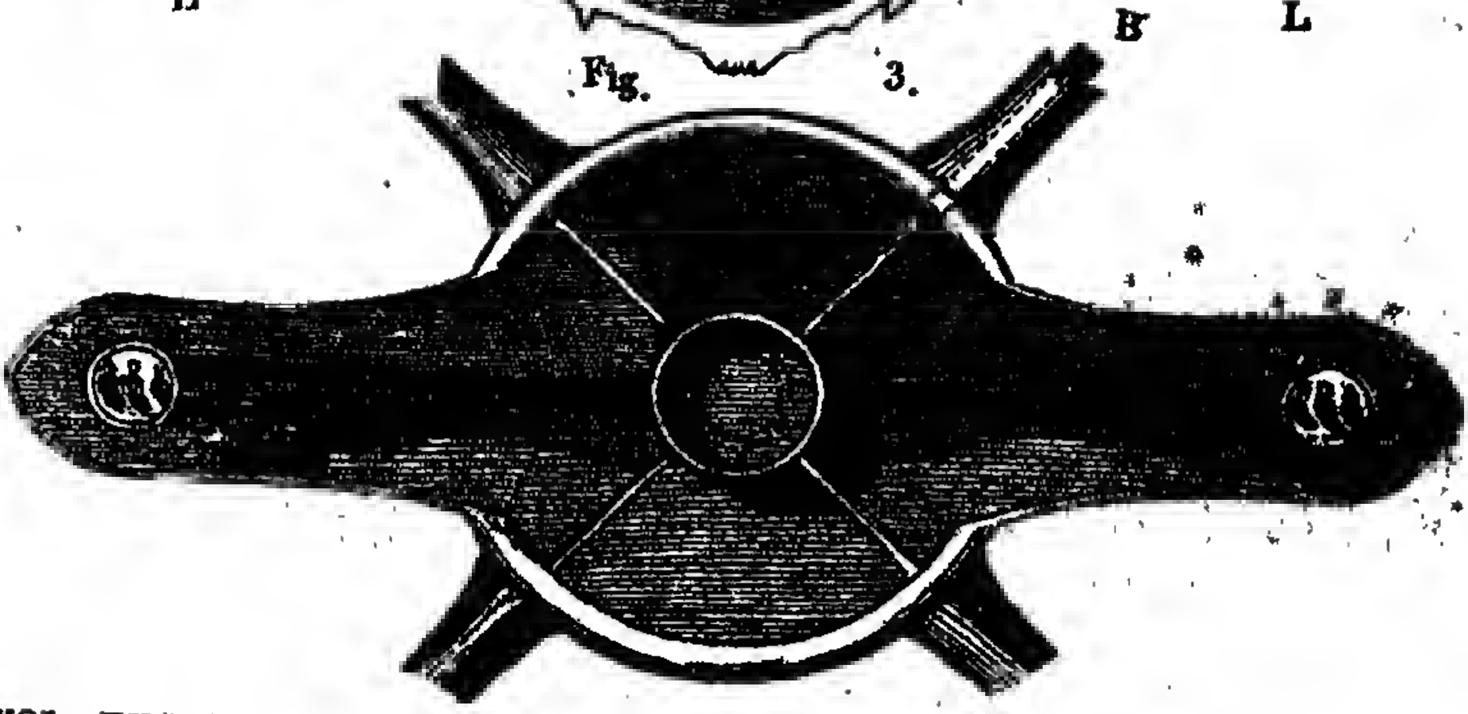


Fig. 3.



MESSRS. SIMPSON AND IRWIN'S APPLICATION OF THE DRUMMOND LIGHT TO DOMESTIC PURPOSES.

The prefixed engravings represent an ingenious application of the Drummond Light (so called after its scientific inventor, the late lamented Captain Drummond,) to domestic purposes, which has been lately invented and patented by Messrs. A. H. Simpson, P. H. Irwin, and T. E. Irwin.* We extract the following description from the specification of the patentees.

The invention is stated to consist "in directing a stream of oxygen gas at an angle across a flame proceeding from ignited pyroligneous spirit or any ethereal spirit, and causing the two gases thus produced to impinge upon a piece of lime or other earth containing lime, placed in a receptacle, so arranged, that it keeps the lime at one uniform height, as regards the point on which the gases impinge on the lime, at the same time that the lime is susceptible of being turned round in its receptacle to present fresh surfaces to the action of the gases as occasion may require."

Figure 1 shows a suspending lamp for a room with the improved light attached thereto; fig. 2 is a portion of the same lamp on a larger scale in section, and fig. 3 is a horizontal section of the same. A A are small jets, through which oxygen gas is supplied from a reservoir or gasometer placed in any convenient place, by means of the pipe B; these jets must be provided with stop-cocks, as at C; D D are jets, which are supplied with pyroligneous spirit by means of the tubes E E, from a reservoir F, which is provided, as in the ordinary Argand lamp, with a sliding valve G. The spirit jets are enlarged or bulbed at their ends to receive some cotton wool, so arranged as to allow the ends of the oxygen jets to be brought within it, and are furnished with small apertures for that purpose, as also when the spirit is ignited. H H are hollow stems, supporting at their upper ends, open cups or receptacles, in which are placed cylindrical pieces of lime I I. The lime is fitted into interior sockets, J J, as shown more clearly in the detached fig. 4, and these sockets are fixed at bottom to rods K K, which pass down the hollow stems H, and at bottom have screw heads L L, by which the lime can be turned round as the flame burns it away; or the rods K may be attached to clock work if required, so that the lime may receive a constant rotary motion.

Fig. 4.

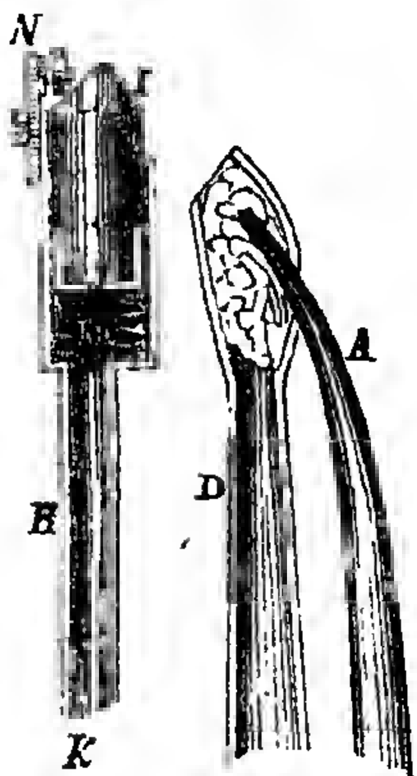
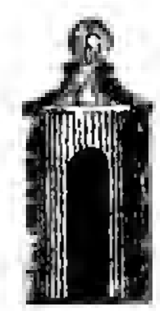


Fig. 5.



From fig. 4 it will be also seen that the interior socket J, rests upon a spiral spring M, which presses the lime upwards, as it is burnt, against a small friction roller N, attached to the outer cup or case, and by which the lime is prevented from being forced out of the socket, and is always kept at the proper height to meet the flame of the lamp and jet of gas. Fig. 5 shows a cap, or cover O, which is placed over the lime when the lamp is not in use to keep it dry; though apparently a trifling addition, it is in its effect very important in preventing the lime from crumbling by imbibing damp from the atmosphere when the light is out, and should be put on the moment the light is extinguished, and while it is yet warm.

What the patentees claim as their invention is, "the directing a stream of oxygen gas at an angle across a flame proceeding from ignited pyroligneous spirit, or any ethereal spirit rising in a tube with two apertures bulbed at each end, such bulb being fitted with cotton wool, or other the like substance, or rising in a tube cut off at its upper end in a slanting direction, as aforesaid, thus producing two gases, and causing the two gases thus produced to impinge upon a piece of lime, or other earth containing lime, and placed in a receptacle furnished with a spring below, friction roller above,

* Patent dated June 17, 1840.

and revolving rod as before described, and for the purposes aforesaid, and with a cover or cap to place over the lime as aforesaid."

ON THE MANAGEMENT OF FURNACES AND BOILERS. BY C. W. WILLIAMS, ESQ.

Sir,—In my last, I enumerated the several kinds of combustible gases which are produced in a furnace, and for which a supply of atmospheric air will be required. The following tabular view of their relative quantities, as generated from each charge of coal, with the periods of their respective development and length of flame during the varying stages of the process, will convey a fair practical estimate of the effects produced in a well regulated furnace by the admission of fresh supplies of air—in the right place, and the right manner. These results (and which may be tested by all, without the aid of a laboratory or chemical professor) cannot fail to convince us how we have been led astray on this subject, by the oversight of practical as well as theoretic men; among whom may be mentioned Tredgold and his followers. Not possessing, or adopting, the means of internal inspection, such men, notwithstanding their unquestionable talent and scientific acquirements, have, themselves, been led to form very erroneous notions on the power and length of flame, and the admission of air to furnaces—giving precise rules for the proportions of furnaces and boilers, with even the appearance of mathematical precision. "The distance," says Tredgold, "to which the flame and heated smoke of a fire will extend, so as to be effectual, will depend on the draught of the chimney and the nature of the fuel; from three to six feet will be about the range in a well-constructed fire-place: that is, about six feet with coal and a good draught, and about three feet with coke and slow draught. This, of course, will regulate the length of the boiler." What connexion those six feet, or three feet, have with the length of the boiler, it would be very difficult to define on any rational or scientific grounds; and I am prepared to show that the dictum of Tredgold (which has recently been republished under high sanction) is unsound and wholly unwarranted in every particular.

I am aware that I have been much censured for presuming to question the engineering skill of those who are connected with boiler-making. When, however, we find those engaged in this important department so misled, the want of some more practical details will not, I trust, be disputed; and I may here observe, that I have already had abundant proof from many of the highest standing in this branch of business, that I have not laboured in vain.

I have already characterized the gases evolved in a furnace, by the general terms of *coal* gas and *coke* gas, (see Mech. Mag. No. 961,) as well for the sake of brevity, as of directing attention to the peculiar nature of the difference between the former, as generated from the coal, during the early part of the process, and the latter kind of gas, as produced, during the later stages, from the clear red, or glowing embers on the bars, as they progressively approach to the character or appearance of a coke fire. As there are many important considerations arising out of these two states of the charge of coal, which are intimately connected with the admission and action of the air, it is of the last importance that we keep this distinction in mind—many of the practical and chemical errors of "smoke burning" inventors being clearly traceable to its neglect. I will here, then, briefly observe, that, by *coal* gas, is meant the hydro-carbon gases (composed of carbon and hydrogen) evolved from the coal, before it assumes a red or ignited appearance; whereas, by *coke* gas, is meant the carbonic oxide, (composed of carbon and oxygen,) formed from the carbonic acid, in its passage through the glowing ignited mass on the bars, in the form of coke, and after the coal gas has been expelled. The quantity of this coke gas will then be in proportion to the thickness or body of such ignited mass—the current of air passing through it, in its state of incandescence. "Carbonic oxide," observes Professor Graham, (in common with all the other authorities,) "may be obtained by transmitting carbonic acid over red hot fragments of charcoal contained in an iron or porcelain tube. The combustion is often witnessed in a coke or charcoal fire. The carbonic acid, produced on the lower part of the fire, is converted into car-

bonic oxide as it passes up through the red hot embers." I here make this special reference to the process by which this carbonic oxide (which I call coke gas) is produced, as I perceive some practical men err by considering it to be an original formation arising out of the glowing matter, after it has been reduced in temperature; whereas the fact is the reverse, as practice, and the highest authorities, prove: namely, that carbonic acid, being first generated, takes up, "as it passes up through the red-hot embers," an additional portion of carbon, aided by the intense heat of the incandescent mass: the incombustible carbonic acid being thus converted into combustible carbonic oxide.

To this latter, air must therefore be admitted, by some other quarter than through such fuel itself from the ash-pit; since, instead of effecting its combustion, such air, so admitted, would only increase its quantity, (by increasing the quantity of carbonic acid,) and make the evil worse. Having detailed this process more at length in my Treatise on Combustion, I need not here dwell on it.

We will now further consider our charge of coal on the furnace, and the following table will present a view of the relative quantities of those two gases produced from it during the progress of its combustion.

Time in minutes.	Coal gas.	Coke gas.	Total, and length of flame.
Charge of coal	none	10	10
5 minutes	10	none	10
10	14	none	14
15	18	none	18
20	22	none	22
25	22	none	22
30	18	none	18
35	14	none	14
40	10	4	14
45	5	8	13
50	none	12	12
55	none	10	10
60	none	10	10

Column 1. gives the time, in periods of five minutes, when the observations were made. Column 2. represents, in numbers, the estimated quantity of coal gas evolved at such periods. Column 3. that of the coke gas at the same periods. And column 4., being the sum of the two preceding columns, may be taken as indicating the gross quantities of combustible gases evolved and entering into combustion, (if supplied with air,) as far as can be estimated by the length of the flame passing from the furnaces over the bridge, and into the flues. It is possible the generation of the coke gas may, to a certain extent, continue longer than the first five minutes, and begin sooner than at the end of thirty five minutes, as expressed in the table—the brilliant light from the coal gas preventing the feebler light from the flame of the coke gas from being perceived. These, however, are minor and insignificant details. I have aimed solely at giving a general description of what is seen; in all cases, however, the quantity and length of the flame are underrated, rather than overrated. The state of the fire at the time of the charge, and many other circumstances, tend to alter the quantities and times: the above, however, may be considered as a correct general view of the matter.

By the table, it will be seen, that the flame, which, according to the dictum of Tredgold, would be but six feet, actually reaches to a length of twenty-two feet, (and even that is by no means the maximum,) while its minimum is not less than ten feet. Tredgold speaks also of the "flame and heated smoke," yet, in my furnace, from which the above table was drawn, and where the largest quantity of gas was produced, there was no smoke whatever, not even as much as would dull the bulb of the thermometer, the flame being of a clear and brilliant white colour.

Another writer on boilers (adopting Tredgold's views) observes, "With boilers whose fire grates are square, and whose lengths are not less than four times that of the grate, we have never met with an instance of the flame reaching to the end of the boiler, provided there was a good draught and the fire properly managed." Now the boiler from which the above table was taken, falls in with these proportions, being fifteen feet long, and the fire-grate square (three feet). Yet the flame not only reached the end of the boiler, but passed above ten to twelve feet beyond it —often extending along one of the side flues, and even illuminating the second. In a score of other boilers, to which I have introduced the air in the proper manner, the flame may be seen, during a

large portion of an hour's charge, reaching from twenty to thirty feet in length, and not an "imperfectly developed and dull reddish flame," but of a brilliant and well-developed character.

These are the errors to which engineers are exposed, and by which manufacturers are led astray, from the want of adequate means of observing what passes within the furnace and flues; and the supplying the necessary air in the right place and manner. For, in the cases above named, when the air-admission orifice is closed, the flame is not only shortened, but nearly extinguished—its length is reduced to the Tredgold standard—and instead of the interior atmosphere of the flues being clear and transparent, it becomes dark, with a cloud of black smoke, which renders internal inspection impracticable, and sight-holes of no avail.

By the above table, we see that before the charge was thrown on the furnace, the coal gas had ceased to be produced: the fire being then clear and of a glowing red, and the flame necessarily confined to that of the carbonic oxide, or coke gas. Of this there could be no doubt, from its peculiar colour and character, as well as from the appearance of the ignited mass on the bars. On the charge, however, being thrown on, the coal gas, we see, takes its place; the former ceasing to be evolved, or nearly so. This is easily accounted for, when we consider the great cooling effect of the fresh coals on the ignited mass, and which thus destroys the very cause of the production of such coke gas, namely, the high temperature and state of incandescence.

The coal gas then goes on increasing in quantity and length of flame, until, at the end of twenty minutes, we see it has reached its maximum of 22 feet from the bridge. Continuing in this state for some time it gradually decreases, while that from the coke gas simultaneously increases, until the former has entirely ceased, and the latter alone prevails. This progression, and even the existence of the two flames at the same moment, is quite perceptible, until the entire of the solid fuel on the bars has become clear with a glowing appearance. Should there be any irregularity in expelling the coal gas, as for instance, from the presence of larger lumps, or the coal not being evenly spread, the appearance inside will present many interesting and instructive proofs and illustrations, which we cannot now stop to describe.

Towards the close of the charge, and when the flame from the coke gas has sensibly diminished, it will be perceived that the time has arrived for a new charge, and this without opening the fire-door to look in. If the proper time be suffered to pass, or, should the next charge be thrown on too soon, in either case the efficiency of the process will be materially affected—the appearance in the interior will vary—the quantity, rate of progression, and even the nature of the evolved gases will, in a great degree, be altered, and the question of time and economy considerably influenced. There is no difficulty in understanding all this. The observer cannot be deceived by the misrepresentations of interested parties, or the truth obscured by plausible theories. By such means of observation, the owner soon becomes his own master, and his eyes are opened to the truth or fallacy of what he is called on to believe or practise. This is, in fact, making the chemistry of combustion on the large scale, an easy, intelligible, and practical science.

It is now to be observed, that during the process of the entire charge, the atmosphere, as it were, of the flues, will be perfectly transparent. This all-important fact is at once ascertained by looking through them, as from S 1 to S 2;—(see engraving in No. 971;) should any cloudiness appear, or the flame assume a reddish or murky colour, we are at once warned that something is wrong, and called upon to rectify it. This subject, however, will be considered more in detail as we proceed.

Thus, we perceive, that at no stage of the process, from the beginning to the end of a charge, is there a flame of less than 10 feet from the bridge, and even extending to above 20 feet in length—thus at once negativing Tredgold's hypothesis. This flame being perceived to be in immediate contact with the boiler bottom, against which it impinges; where then, it may be asked, can we find any ground for asserting that the length of the flame should "regulate the length of the boiler?" But with still greater force do I ask, where is the foundation for the assertion that there is no combustible gas

produced, and therefore, no demand for air, when the fire in the furnace has become clear, red, or incandescent? Or, that the air so introduced could have, not a heating, but so cooling an effect, as actually to affect the boiler plates injuriously? Nothing can be farther from the fact. Such assertions could only be the result of mere conjecture, in the absence of internal inspection, since, with such aid, it would be impossible to deny or resist the evidence of our senses: yet, such theoretical absurdities are still palmed on the unsuspecting manufacturer, and even by those who affect to be practical men. Let such assertors bring their theoretic reveries to the test of observation. Let them examine a furnace thus furnished with the means of internal observation, and they will then be in a position to appreciate, by both seeing and feeling, what are the results from the admission or exclusion of air. The value of the admitted air, in effecting the combustion of the evolved gases will, however, be more fully illustrated when we come to consider the actual temperature and actual condition of the flues, which shall be the subject of my next communication.

I am, Sir, yours, &c.

C. W. WILLIAMS.

Liverpool, April 8, 1842.

PROGRESS OF FOREIGN SCIENCE.

[In continuation from page 231.]

Artificial Pouzzolanas.

Vicat, whose masterly researches upon the subject of limes and cements are so well known, found, many years ago, that a slight roasting had important effects in improving the clays used in the fabrication of certain pouzzolanas. He has lately announced, that in order that this roasting shall produce its maximum effect, it must be competent to expel fully the water which makes the clay a hydrous silicate of alumina.

Berthier has recently confirmed this determination with reference to some cement clays, brought from Algiers; the fact is of great importance in the correct practice of making artificial cements.

Foreign Agriculture.

The true nature of manures, and the rationale of their action on vegetation, has only begun to be understood within a few years, and is even now much better known, and more scientifically acted on, in certain parts of the Continent than with ourselves.

Until ammonia was known to be the really important matter of all manure, this, its very essence, was every where permitted to be volatilized in the process of violent fermentation, and is even still so in most parts of our own country. A better system, prevails, however, over a large portion of Germany, in Alsace, and in Holland and Switzerland. In the latter country they wash the dung by repeated watering at intervals. The washings are collected, rich in ammoniacal salts, and are saturated with a solution of sulphate of iron, (green copperas) or with sulphuric acid direct, to change the volatile salts of ammonia into fixed sulphates, and in this state the liquid manure is applied to the soil. It produces the most vigorous vegetation, and the sulphate of ammonia being fixed, is all assimilated by the plants, in place of being volatilized in the state of carbonate of ammonia, as with us, when crude fermenting manure is lavishly spread over our lands. Gypsum is often used in place of sulphate of iron, and is readily decomposed by organic matter in certain stages of decay.

In Great Britian, where sulphate of iron from refuse pyritose coal and gypsum may be had almost for nothing, it is singular to find its use thus almost unknown amongst us, while practised by those to whom both these articles are scarce and dear.

A M. Schattenmann, of Bouxmiller, in Alsace, has greatly distinguished himself in this branch of agriculture. As director of some great chemical works, and having had under his disposal the manure produced by two hundred artillery horses, cantoned for four years at Bouxmiller, he has had opportunities of practically experimenting upon a great scale, and has communicated his methods and their results to M M. Dumas and Peligo. His dung-heaps are made on a great square space, paved or puddled, and with a fall from all sides inwards. The stable dung is heaped all over to the height of about 12 feet; a well, sunk at one side, supplies a large quantity of water, which is at intervals distributed by wood shoots over the

heap, which is *never permitted to get into a state of violent or heated fermentation;* the mass is stratified with powdered gypsum, or copperas, and the drainage from it, with all the washings, are collected in a large underground tank in the centre, where they are saturated further, if requisite, with gypsum, or sulphate of iron. This latter fluid is used, as requisite, by watering the surface with it, and such are its potent effects, that he says, a name traced out by watering with it in the grass, can be distinctly traced in a few weeks by the dark coloured and vigorous vegetation produced where it was touched. The effects of this treatment on the stable dung, are to produce, in about three months, a mass (*aussi gras et pâteux*) as fat and pasty as cow-dung, and, according to his experience, fully as powerful.

For a journal not professedly agricultural, the full details of this intelligent gentleman's methods would be out of place; but to those interested in the perusal of the original paper ("Comptes Rendu," No 7, for February last) would be important. The theoretic grounds on which this successful practice depends, have been fully developed in a form accessible to the English reader by Dr. Leibig, in his report on organic chemistry, applied to agriculture, &c., addressed to the British Association.

Effects of Tide upon Artesian Wells.

An Artesian well, which has been some time sunk at the military hospital of Lisle, has been observed to vary considerably in the force and volume of its supply. M Bailly, captain of engineers, has made a long continued series of accurate observations upon the variation, and has arrived at the following conclusions.

The maximum supply is = 63·55 lit. per min. The minimum = 33 lit. The mean of all the experiments = 48·55 lit.

The maximum height to which the water will rise (above the surface namely) when prevented from flowing off is 2·385 metres, the minimum 1·956 metres, the mean of all 2·253 metres.

The greatest variations, both in supply and height of column, correspond with the periods of the moon's syzygies, and the minima of both correspond in an equally constant manner with the time of quadratures. It may hence be concluded that the phenomena are due to the tides. The periods of maximum supply were found to be eight hours after high water at Dunkerque and Calais, so that it would appear that it takes that time to transmit the pressure of the tidal column from these ports, or from the nearest point of coast, to Lille.

Some connexion between the tides and the level of well waters has long been conceived, or observed, in various parts of Great Britain, but heretofore never identified with the actual periods of rise and fall. Some extremely curious questions of a geological character arise from this result. How does the tidal water act on that of the well, without gradually making it brackish? Is the fresh water merely contained between beds of clay, or rock, which partly float upon it, and are *compressed* by the advancing tide, and forced to yield up their watery store, like wine pressed from a skin; or do the columns of salt and fresh water actually mingle? And if so, does the sea water lose its salt in the bed through which it passes, by decomposition, and become fresh? It is quite conceivable that such re-actions might take place as resulting in nearly insoluble salts, would leave the sea water as fresh as many spring waters are found.

Metalliferous Deposits of Sicily.

An able report has been made to the Academy of Sciences on this subject, by M. Adrien Paillette. From this it appears, that some time ago an English company obtained from the Neapolitan government, authority to work mines in Sicily, and full of expectation from the boasted historical accounts of its ancient riches, both mineral and agricultural, had, without any previous research, but merely on inspection of some old working, prepared means of opening mines, and working them on a large scale. The results were unsuccessful, like many others of the same sort, begun in the same reckless way, on both sides of the Atlantic; and they were now so discouraged, that the pumping engines, and stampers, &c., brought at an immense cost from Wales, lie to this day in store at Messina, or abandoned on the shore. Under these circumstances, some of the principal parties concerned determined to send a commission of mining engineers to learn what were the real mineral riches of the country. M. Juncker, *ingeniéur en chef* of the Royal School of mines, and M. Paillette, civil engineer, were ap-

pointed, and the present report is the result of their labours. In the introduction they show that in place of this country having been anciently (as believed currently) celebrated for its mines, that no mine was ever known to have been wrought in it previous to the year 1720, and that since that time its mines never had a great, or durable development. They explored in all seventy-one mines, which lie principally in granite and talcose schist; the veins are small, and run in all directions, observing none of that regularity as to bearing, which enables the practised Cornish or Saxon miner to predict, almost with certainty, as to his future labours.

The general character of the lodes is very similar to that of the mines in the central district of France, the Limousin, the Cevennes, &c., and the analogy even holds with respect to the rocks containing them.

Veins of modern porphyritic granite have been discovered penetrating the more ancient fine grained granite, and some metamorphic rocks of transition. The veins generally lie between the granite and the mica schist (this is also the case in Ireland), the ores chiefly found are, argentiferous galena, bournonites mispickel, and grey copper—the minerals of lead most abundant, and principally antimonial.

The most novel or interesting fact given in the report, is with reference to the change of mineral character in the lead ores, said to follow a change in the matrix of rock; thus, the galena is poor in silver in the granite, but rich in this metal when lying in the schist, and still more so when ores of lead and copper occur together.

The report is completed by a table of the assay, as to valuable product, of all the ores found in Sicily and Calabria. The whole is a model of how mining speculations should be commenced, as the origin of the investigation is a beacon to warn Englishmen (if they can be taught) of the fallacy of the El Dorados which they so readily fancy to exist in every foreign land.

Crystalization of Salts.

M. Longchamps has published some experiments tending to show that *all* salts expand in the act of crystalization; and that the apparent contraction which often takes place, arises from loss of heat in the solution.

Spring Water containing Arsenic.

Some hot springs have been discovered in Algiers, or *Algeria*, as the French love to call their valuable possession in Africa, at Ham-am-escoutin, which are said to contain a small quantity of arsenic. The water is at 80° Reau., and deposits a large quantity of blueish white sediment which has not yet been an-

Safety Paper for Deeds.

It is perhaps known to most English readers, that such has been the extent of fraud committed upon the stamp department in France for years past, by using stamped papers a second or third time, the ink having been discharged, and such the amount of private fraud committed in various ways, by this, and analogous trickery, that a commission of the French Institute has been, for a very long period, engaged in the investigation of the subject, and the endeavour to provide a remedy; and that they have invited and offered rewards to inventors of methods of making safety papers for stamped documents (*papiers de sureté*). A great variety of propositions have been offered to them; some depending on the impregnation of the paper with matters actable on by ink, or other fluids; others on wire-marks, &c., in the substance of the papers; and others (the most numerous) on the production of inks which shall be indelible. Amongst the latter, Bracconot, whose name is familiar as a chemist, has produced apparently the best ink, but the commission, until very recently, had received no plan which it considered as meeting all the conditions of the question. The problem is, however, said at length to be almost, if not altogether solved by MM. Knecht and Zuber, who have produced a paper, which is made by machinery, with a wire-wove mark, in endless sheets, and at the moment of its manufacture (before it leaves the machine) is printed all over with an open pattern in common writing ink, without any thickening or mixture; thus any agent used to destroy writing in common ink upon it, will destroy this pattern too. The paper is further protected from erasure by embossing, and by engraved vignettes, printed all by the paper-making machinery, or actuated by the same train,

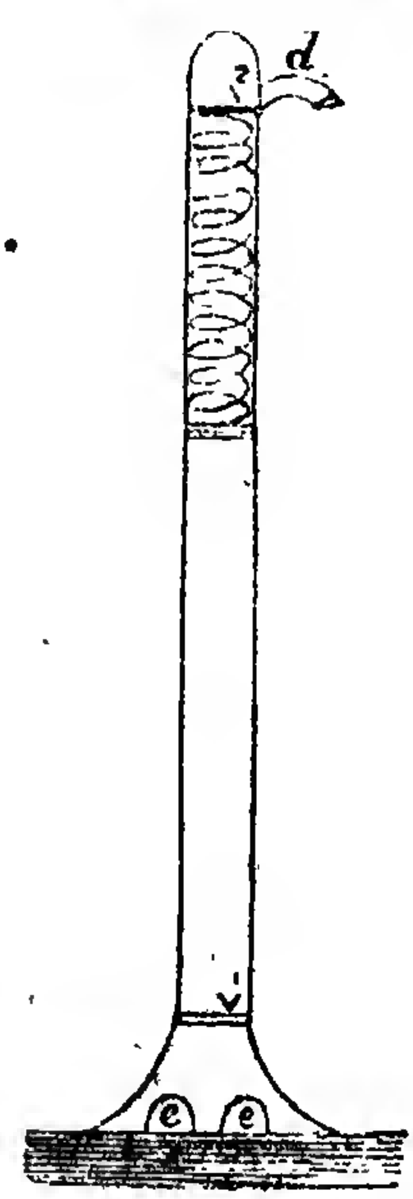
This last method is obviously founded on the principle that no writing fluid for ordinary use can be found, capable of being discharged by any agent that will not also affect common ink, and this is probably true.

The stamps in our own country will probably soon begin to suffer if they are not doing so already, by frauds committed by the aid of electrotype, for which, until colouring and embossing are united, there is the most obvious facility; and the temptation to fraud will be increased by the anticipated increase of stamp duties.

Elliptic Compasses.

A new elliptic compass has been brought forward in Paris by M. M. Hamman and Hempel; it traces the *whole* curve, and is founded on the genesis of the curve by the motion of a point which turns round a second, which, in its turn, revolves with a velocity (*sous-double*) round a fixed point.

WATER ELEVATOR.



Sir,—In consequence of reading in your Magazine the description of Mr. Walker's water elevator, I am induced to send you the particulars of a small instrument for raising water, that I made some years since, but which has been destroyed. I have, however, recently made another, which answers the purpose. It appears to me to be quite a new contrivance in the art of water raising.

I am, your obedient servant,

S. P.

Great Portland-street.

Description.

For the experiment, take any length of lead, or other pipe; enlarge the bottom a little, as in Mr. Walker's instrument, and insert a valve (v^1) to open upwards. Make a few openings, as *e*, *e*, in the wide part, to admit the water to the valve. On the top of the pipe fix a spiral wire of the size of the pipe, say 8 or 9 inches long, and on the top of the wire fix a piece of pipe of the same bore, and about 3 inches long with a valve, v^2, next the wire, to open upwards; close the top of the short piece, and insert the discharge, or mouthpiece (*d*); inclose the whole in a tube of mackintosh cloth, which must be perfectly air tight, and rather longer than the spiral. I make the tube first, and draw it down over the pipe, before I fix the spiral and top; when they are fixed I then draw it over the spiral, and bind it tight at both ends. On placing the instrument, as thus completed, in water, and working the spiral a few times, you will find it answer the purpose.

In my first instrument I made two guide-rods, and fixed them to the short-piece, and they worked through four eyes on the longer piece, and kept the spiral always upright. The spiral is merely to keep the tube from collapsing, which it would do without it.

I have no doubt that if a tube were constructed of leather, say 16 or 18 inches long, and 3, or more, inches in diameter, and fixed on to a pipe of the same bore, it would be found to work well, especially if it were fixed to the pump-rods of Mr. Walker's machine. I find by the drawing, Mr. W. has to lift the whole length of pipe, which, in some cases, must be objectionable on account of the great length.

S. P.

INSTITUTION OF CIVIL ENGINEERS.—MINUTES OF PROCEEDINGS OF SESSION, 1842.

JANUARY 11.

"*Description of a portion of the Works of the Ulster Canal.*" *By Thomas Casebourne, M. Inst. C. E.*

The Ulster Canal, which is described in this communication, was designed for the purpose of facilitating the intercourse between the west and north of Ireland. It commences at the southern extremity of Lough Erne, in the county of Fermanagh, whence it extends for a length of 46 miles, and enters the river Blackwater, near the village of Charlemont, in the county of Armagh, from which there is an outlet through Lough Neagh to the ports of Newry and Belfast. The total cost of this work will amount to about 210,000*l.*, or 4,565*l.*

Allusion is made to a proposed junction canal between the rivers Boyle and Shannon, which may be considered as an extension of the Ulster Canal westward, effecting a junction between all the navigations of Ireland. By its means the produce of the town of Boyle, and the agricultural district around it, would be conveyed directly by steam to Belfast and Newry.

At the time of this communication, the Ulster Canal was rapidly advancing towards completion; it was navigable up to Clones, a distance of 40 miles from its commencement, and would be opened to Lough Erne during the summer of 1841.

A description is given of the most difficult and expensive portion of the canal, which is situated at about six miles along the line from Charlemont. The length of this part is about three-fourths of a mile, and it comprises seven locks. The expense of construction, exclusive of the value of land, was 17,053*l.* 4*s.* 9*d.*; in order to diminish the expense as much as possible, the canal was contracted in width in two points, where the local impediments were considerable. The transverse dimensions of the canal are, 19 feet 6 inches at the bottom, 36 feet at the surface of the water, and 42 feet at the top of the bank,—giving a slope of 3 to 2 at the sides of the channel. The depth of water is 5 feet 6 inches in all the reaches, except the summit level, which is capable of containing 7 feet of water. The course of this portion of the line lay along the bottom of a steep ravine in a limestone rock, parallel with the channel of a mill-race adjacent to the river Blackwater; the mill-race was, therefore, diverted into the river between the first and fifth locks of the canal. Between the third and fifth locks the bed of the canal was formed by benching in the rock on one side, and embanking on the other with the materials so obtained; beyond this it was cut for a distance of nearly 350 yards through the limestone; in one place to a depth of 41 feet. The sides and bed were there lined with puddle, and protected by a facing of rubble wall. Thence, to the seventh lock, the channel was again formed by benching and embanking through a clay soil, where much caution was necessarily exercised in preventing slips at the foot of the embankment, which was subject to inundations from the Blackwater.

The masonry was all constructed of limestone from an adjacent quarry.

Two Appendices are subjoined to this Paper. The first of these gives in detail the items of expenditure for the portion of the canal described; the second contains a particular description of the locks and lock-gates, the bridges, and the earth-work. The locks are 73 feet long, 12 feet wide, and vary in rise from 6 to 11 feet. They are all constructed in ashlar masonry.

The paper is accompanied by three drawings, descriptive of the general plan and the details of these works, which were originally designed by Mr. Telford, and are now under the direction of Mr. Cubitt. They have been executed almost entirely under the superintendence of the author.

"*An account of the permanent way of the Birmingham and Gloucester Railway.*" *By G. B. W. Jackson, Grad. Inst. C. E.*

The object of this railway is to afford a direct communication between the Western and the Midland Counties of England. The communication describes the course of the line until it reaches Cheltenham, where it joins that which was formerly called the Great Western and Cheltenham Railway, which terminates at Gloucester. Its length is 54 miles. The prevailing inclination is 1 in 300; but on the "Lickey" incline, near Bromsgrove, the rise is 1 in 37 for a distance of $2\frac{1}{2}$ miles, in ascending which the trains are worked by American locomotives, in addition to the usual train engines. The northern portion of the railway appears to lie on the new red sandstone; then passes to the oolitic formation, on which it terminates. In the former, the principal cuttings are through marl, some of which is exceedingly indurated, and troublesome to work. The principal strata of the latter system are blue

and yellow clays. Near Cheltenham, the shifting sand frequently rendered sheet-piling necessary in passing through it. The waters of Droitwich and Cheltenham were found to possess a saline quality, which rendered them unfit for the use of the engines; that from the surface sand near Cheltenham, is, however, extremely good.

The building materials employed on this line were—the sandstones of the Lickey and Forest of Dean, tho lias of Norton and Wadborough, and the oolites of Cheltenham and Bredon, together with brick, for which earth was readily procured throughout.

The cuttings and embankments, with the details of the permanent way, are severally described. The surface width is 30 feet. In the formation of embankments and cuttings, the usual methods appear to have been adopted. In the former, the slopes vary between 3 and $2\frac{1}{2}$ to 1; in the latter, between 2 and $1\frac{1}{2}$ to 1.

In cuttings, there is a system of drainage beneath the ballast, consisting of longitudinal drains on either side of the line, connected by cross spits, all of which are filled up with broken stones. The rails are supported by chairs and intermediate saddles, which rest on longitudinal balks; and these are bolted to transverse ties. On embankments, whose height exceeds 5 feet, the cross spits, longitudinal balks, and saddles, are all dispensed with.

The length of the bearings, the weight, dimensions, &c., of the iron and wood work, with the manner of putting them together, are then noticed.

The timber employed was, American pine, and English beech, or larch. The various prices are enumerated of the materials and labour for the permanent way, of which the average cost per mile amounted to 5,430*l*. The present condition of the line is stated to be good, and its general working to have been perfectly satisfactory since its opening in June 1840.

Annexed is a description of an artificial ballast obtained by burning clay, which was employed where the country did not afford natural ballast. Its expense slightly exceeds that of the ordinary ballast; blue clay burnt in kilns was found to answer the purpose best, but it does not appear to form a successful substitute for gravel. The results of experiment show it to form a very imperfect drain. The author states that he has always observed the quality of this ballast to suffer in proportion with the quantity of lime contained in its composition.

The paper is accompanied by four drawings, illustrating the construction of the permanent way.

"*Description of a Water-pressure Engine at Illsang, in Bavaria.*" *By William Lewis Baker, Grad. Inst. C.E.*

The machine described in this paper is the most perfect among nine engines constructed by M. de Reichenbach, for the salt-works at Illsang, in Bavaria. These important works are situated in the most southern part of the kingdom; they are supplied from a mine in the valley of Berghtesgaden, and the salt-springs at Reichenhall. The salt was procured from the former in two states,—that of rock salt, which was extracted by blasting, and that of brine. The rock salt was conveyed to Reichenhall, and there underwent the purifying process. But both these methods were attended with disadvantages from the scarcity of fuel; the old method was therefore abolished, and a line of pipes of 7 inches diameter was substituted, which was laid between the two places; a distance of about 60 miles.

A series of water-pressure engines, each working a forcing pump, and being themselves worked by a head of water, were placed in convenient situations upon the line. The mine is now worked by forming cavities in the beds of salt, and filling them with water, which soon becomes strongly saturated brine; it is then pumped up, and forced through the pipes to Reichenhall, where a portion of it is retained, and the rest is sent on to Frauenstein, which is at the extremity of the line. At these places, the process of evaporation is carried on, and the salt is manufactured in the usual manner.

The paper is illustrated by a drawing of the engine, showing the details of construction alluded to in the communication.

"*A Memoir of Captain Huddart.*" *By William Cotton, F.R.S., &c.*

This memoir is intended by the author chiefly to supply some additional facts which are omitted in the account which was published by his son soon after the decease of this distinguished man, whose "great powers of mind, indefatigable industry, and high principles, raised him to a most honourable position among men of science."

Joseph Huddart was born at Allonby, in Cumberland, the 11th January, 1740. His father was a shoemaker and farmer, and had also a small interest in a herring fishery. Young Huddart was placed under the tuition of Mr. Wilson, the clergyman of the village, and from his son, who had been at Glasgow, he acquired some knowledge of mathematics and astronomy. He early displayed much ingenuity in the construction of models of vessels and of machinery; and while herding his father's cattle, he was occupied in

mathematical reading, drawing, and calculations. His determination to adopt a seafaring life was opposed by his friends; and it was not until he was called upon to take his share of the duties on board the herring-fishing boats, that his father was reconciled to his becoming a sailor. At this period, during the hours of rest after his labours, he was engaged in making nautical observations, and laid the foundation for the chart of St. George's Channel, which was published by his friend, Mr. Laurie, from his survey, and is still the best chart of that locality.

On the death of his father, in 1762, he took the command of a sloop which was employed in carrying salt herrings to Ireland. He then constructed a brig according to a model of his own, every timber being moulded by his own hands. In this vessel he traded for some years to America; until, in 1771, he was induced by Sir Richard Hotham (who had discovered and appreciated his judgment and knowledge,) to leave the brig and engage in the East India mercantile marine. In this extensive field of usefulness, Huddart evinced the superiority of his talents and his inflexible integrity; and his example as a commander was generally followed. While in the Indian service his attention was drawn to the defects in the usual manufacture of cordage, and led to the improvements which he afterwards so successfully accomplished.

He subsequently took a prominent part in the direction of affairs at the Trinity House, the Ramsgate Harbour Trust, and the London and East India Docks, where the valuable advice given by him was properly appreciated, as it was also by the civil engineers, with whom he was so frequently called upon to co-operate.

The memoir then relates many interesting anecdotes of his private life, illustrative of his general scientific acquirements, and of his amiable disposition. It then details, at considerable length, his experiments for the determination of the lines for ships, which, consistent with stability, and what might be required for stowage of cargo, would give the greatest velocity through the water.

The author enters fully into the account of Huddart's inventions and improvements in rope machinery, which he raised to such a pitch of perfection. This machinery, which is now transferred to the Royal Dock Yards, has already been before brought under the notice of the Institution by Mr. Cotton and by Messrs. Dempsey and Birch, in communications, for which prizes were awarded.* The general introduction of chain cables rendered this machinery less useful, but could not take from its original merit; and, in its present position, it will long remain a monument of Captain Huddart's perseverance, mechanical skill, and scientific knowledge.

* Minutes of Proceedings, 1838, pp. 1—38 and 39—1841, page 171.

Sir James South thought that Captain Huddart's scientific attainments as an astronomer had not received their due meed of praise in the memoir; but more especially, that the equatorial instrument, which he was now fortunate enough to have in his possession, should have been alluded to more particularly. That instrument was constructed by Messrs. Luke Howard and Co., of Old-street, from the designs and under the daily superintendence of Huddart. The greatest part of the instrument was put together with his own hands, and the result of this combination of skill and attention was, that up to the present time, the instrument had been unequalled; in fact he must be permitted to say, that he considered it *perfect*. It had been used for all kinds of observations,—transit, declination, and equatorial; and, in all, with satisfaction to the astronomer. With it Mr. Herschel had made many of his observations, and always expressed himself in the highest terms of it. It had been examined by most of the eminent constructors of instruments, as well as many civil engineers, who all entertained the same opinion of its perfection: and, after a minute inspection, one constructor observed, "Here is the best system of edge-bars and bracing I ever saw, and my opinion of the instrument is, that it is perfect in every part."

Sir James then related several anecdotes of Huddart's habits of observation. On one occasion, being ordered to sail from Madras at a certain time, he delayed his departure, because he observed a sudden fall of nearly three-quarters of an inch in the mercury of the barometer. The result of this disobedience of orders (for which he incurred momentary censure) was, that his vessel alone of all the convoy escaped destruction.

The President believed that Captain Huddart was the first to mark out the direct course to China, which is so generally followed at present. He was also the first observer who took a transit instrument out with him, to determine the rate of the chronometer. It was particularly worthy of notice, that the equatorial instrument and the rope machinery, both of which had been designed by and executed under the directions of a self-educated man, destitute of the means of acquiring instruction either in astronomy or mechanics, had been up to the present time, unequalled either in conception or in the perfection of their exe-

cution. Huddart was the constant coadjutor of civil engineers: he assisted the late Mr. Rennie in many of his surveys of harbours, and on those occasions had always the command of the vessel, even if he did not participate in the actual operations of the survey. Whether Huddart was viewed as a sailor, boldly striking out for himself a new track to his destination; as a shipbuilder, constructing a vessel in order to avoid the defects which he observed in the ordinary class of ships; as a hydrographer, displaying in his chart of the St. George's Channel those powers of observation and of reasoning which made him an astronomer; as a constructor of the equatorial instrument, which had been so justly commended; or as a mechanic, designing and constructing one of the most beautiful pieces of machinery on record, he appeared equally great.

The Institution was much indebted to Mr. Cotton for this memoir of Captain Huddart, whose name would be always venerated by every member of the profession of civil engineering.

Mr. Thornthwaite must in justice correct a misapprehension relative to the laying machine for cables; the idea of that machine originated with the Reverend Edmund Cartwright, who had projected more improvements in cotton machinery than any person, except Arkwright. The machine was materially modified by Captain Huddart, and to him must be given all the credit for the perfection of its proportions, and its careful construction, which had enabled a machine weighing twenty tons, and revolving rapidly upon one vertical spindle, to work a number of years without costing £5 for repairs. The register, which preceded the laying machine several years, was entirely Huddart's invention, and was the origin of his improvements in rope machinery.

February 8, 1842.

"*Description of the Port of London, and of the Works at the London Docks.*" By *Robert Richardson, Grad. Inst. C. E.*

In this communication the author examines the state of the Port of London, when the accommodation for landing and bonding foreign produce was almost entirely limited to a single spot, called the "Legal Quay," which was only about 1,400 feet in length, extending downwards from London Bridge, affording no greater facilities for commerce in the beginning of the nineteenth century than in the year 1660, when the quay was appointed. This state of things continued until the year 1773, when Mr. J. Sharp suggested the formation of floating docks. In the year 1800, the West India Docks were commenced; in the year following the London Docks were projected, and in the year 1805 the East India Docks were commenced. For all these undertakings Mr. Ralph Walker was appointed engineer, having Mr. William Jessop associated with him for the West India Docks. The paper enters fully into the bad state of the navigation of the river, owing to defective management and other causes; gives a table showing the progressive increase of tonnage and number of ships from the beginning to the close of the last century; mentions the various plans of Dodd, Spence, Revely, and others, for diverting the channel of the river for the formation of more extensive docks, near the Isle of Dogs; and then proceeds to detail minutely the origin and progress of the London Docks, giving the dimensions and mode of construction of the principal works connecting the Eastern Docks with the Thames, which were constructed under the superintendence of Mr. H. R. Palmer, to whom the author has been indebted for much of the information contained in the paper.

The communication is accompanied by fifteen drawings, showing the details of construction of the locks and gates, bridges, quays, embankments, &c.

February 8, 1842.

"*Description of the Ponte della Madelena, over the River Serchio, near Lucca.*" *By Richard Townshend, Assoc. Inst. C. E.*

The bridge described in this communication, is situated about half-way between the town and the baths of Lucca, in the Grand Duchy of Tuscany; it was built by Castracani, in the year 1317, on the site of one which had been constructed by order of the Countess Matilda, early in the twelfth century, and subsequently destroyed; it is believed that a Roman bridge formerly existed on the same spot.

The present bridge is of grey limestone of the country. The large arch of 126 feet 6 inches span, is of a semicircular form, and springs directly from the bed of the river, without any prepared foundation. The smaller arches are of various spans, 46 feet 10 inches, 33 feet, 28 feet, and 7 feet 6 inches. The style of construction is somewhat similar to that of the Pont-y-prydd, over the Taff, in South Wales.

An engraving of the bridge accompanied the paper.

"*Description of the Mill, Forge, and Furnaces of a Welsh Iron Work.*" *By Thomas Girdwood Hardie, Assoc. Inst. C. E.*

The author commences by describing the

general plan of an iron work, consisting of six blast furnaces, four double-fire refineries, and a forge and mill, capable of converting into bar-iron the produce of the six blast furnaces.

He then enters very fully into certain alterations of the interior shape of the blast furnaces introduced by him at the Blaenavon works, from which have resulted an economy of fuel, regularity of work, and an improved quality of iron. The principal alterations appear to be, making the interior diameter greater above that at the boshes, and establishing a proper ratio between the diameter of the boshes and that of the charging place, and proportioning both to the height of the furnace. The opinions are supported by calculations of the quantity of blast used in smelting given quantities of ore, and the effect which the form of the furnaces must have in directing the current of the blast through the materials, by which also the point of fusion would be necessarily effected, and the chemical combinations varied. The particulars are then given of the construction of the furnaces at Blaenavon, and the details of the blowing engines, blast mains, regulators, valves, &c., with calculations of the quantity of blast used in the various processes of the manufacture. The construction of the casting houses, with the mode of ventilating by the iron roof, is detailed. The general arrangement of the balance pits, coke yards, mine kilns, and bridge houses are shown, and the author proceeds to describe the forge and mill, which have thirty-five puddling furnaces, with hammers, shears, rolls, and heating furnaces in proportion. He then condemns the usual practice of leaving the coupling boxes loose upon the spindles, as liable to break the rolls, shafts, or machinery, and gives theoretical and practical reasonings for preferring fixed couplings.

The communication is illustrated by three drawings, showing the general distribution and the details of an iron work.

Mr. Lowe believed that there was an incorrectness in the statement of the iron after being freed from its oxygen by the heat of the furnace, taking up a dose of carbon from the coke, thus becoming a carburet of iron, which is a fusible compound, and as such, fell melted into the hearth. On the contrary, he thought that the iron was combined with carbon in the ore, and that there was not any necessity for the medium of the fuel to charge it with carbon.

In reply to "Why the ore required, or why the iron carried away, any of the carbon of the fuel?" Dr. Faraday stated, that the ore being essentially a carbonate of iron, the first action of heat, either in the mine kilns or in the furnace, was to draw off the carbonic acid and leave an oxyde of iron, and then the further action of the fuel (besides sustaining a high temperature) was to abstract the oxygen of the oxyde, and so to reduce the iron to the metallic state, after which a still further portion of the carbon of the fuel combined with the iron, bringing it into the state of easily fusible, or pig-iron.

As carbon may be communicated to the iron in two ways, distinct in their nature, either by contact with solid carbon, as in the process of cementation, (that by which steel is commonly converted,) or from the carbonated gases, either carburetted hydrogen, or carbonic acid, which occupy nearly every part of the air-way of the furnace, it would be desirable to distinguish, as far as may be in any furnace having a particular form or action, what proportion of the whole effect is due to the one mode of carbonization or the other.

Mr. Wallace stated that the ore was a carbonate of iron, or a protoxyde of iron and carbonic acid united, and not a carburet of iron, (or iron and carbon simply,) as was generally believed. In smelting, the carbonic acid was driven off, the simple oxyde remaining; the oxygen of which, being carried off by the heat, left the pure iron, which, combining with the carbon of the coke, formed a fusible carburet of iron, or the pig-iron of commerce.

Mr. John Taylor observed that his brother, Mr. Philip Taylor, being sensible of the advantages to be expected from the use of anthracite in smelting iron, made a series of experiments several years ago, from which he derived the opinion that the carbon absorbed by the metal, and which is necessary to produce it in the shape of pig-iron, must be presented in a gaseous state to the mass in fusion; and as anthracite did not afford a sufficient supply of coal-gas during combustion to produce the proper effect, he proposed to adopt a very ingenious method, by which this gas would have been thrown into the furnace in such proportions as might be found necessary, mixed with the common air employed as the blast.

Circumstances interrupted the course of these experiments, or it is possible that the use of anthracite for this important application might have taken place at a much earlier period than it has happened to do.

February 15, 1842.

"*Description of Chelson Meadow Sluice.*" *By Theodore Budd, Grad. Inst. C. E.*

The sluice which is described in this communication was erected from the designs of Mr. Rendel for the Chelson Marshes in

Devonshire, which, being very low, had previously suffered much from floods, but now are entirely relieved. The novelty in the construction consists in hanging each of the doors respectively by two hinged flat bars of iron, of 18 feet 6 inches, and 15 feet 3 inches in length, and thus, by placing the centre of motion so high above the centre of gravity of the doors, to give greater freedom of action than by the modes usually adopted in similar works.

The dimensions of all the parts, and the method of construction, are given in great detail, and are illustrated by a drawing.

Mr. Rendel explained that the sluice-doors which had been superseded by those described by Mr. Budd, were of the ordinary description, placed side by side. They were frequently hinge-bound and clogged up, which caused the land to be flooded sometimes for three months during the year; the hinges were attached in the usual manner to the frames, close at the head of the doors, and they required a pressure of at least 6 inches of water to act upon them either way. He considered the principal advantages of these doors to consist in the freedom of action given by the length of the bar-hinges by which they were suspended, their giving the full extent of opening, and the pressure of 1 inch head of water sufficing either to open or close them.

Mr. Prior inquired whether there was any similarity between these sluice-doors and that erected by the President near Blackfriars Bridge, at the bottom of Fleet Ditch. That door was so well hung as to be even acted upon by the wind; and the slightest pressure of water sufficed to open or to close it.

The President explained that the principle was not the same; at the Fleet Ditch sluice double hinges were used, or rather hinges with a link between the part attached to the frame, and that which was screwed to the door;—that form of hinge always acted freely, and allowed the doors to open with a slight pressure.

STEVENSON'S APPLICATION OF MARINE SURVEYING AND HYDROMETRY TO THE PRACTICE OF CIVIL ENGINEERING.*

In an insular and maritime country like Great Britain, there is no branch of civil engineering which one would expect to see more assiduously cultivated, or in a more matured and perfect state, than hydraulics.* But although we can, perhaps, boast of as much in the way of performance in this line as most nations, it is but too certain that we must look elsewhere than to English books for nearly all the science belonging to it. Our Smeatons, Telfords, and Rennies, have at best but turned to good practical account, in the embankments, drainages, docks, &c., for which they are celebrated, the principles of construction which they found developed to their hands in the writings of the Italian, Dutch, and French engineers and philosophers, particularly Guglielmi, Frisi, Mariotte, Belidor, Bossut, and De Buat. Of our men of abstract science, the only names which occur to us as connected with contributions to hydraulics, worthy of mention, are, Robinson, Hutton, Leslie, and Young; and these contributions, besides being scanty, are all more of an elucidatory than original character. Of *making a study* of this branch of engineering knowledge, more than any other, to qualify a man for professional eminence in England, few, if any, of our engineers, have ever thought. In this, as in but too many other matters, it has been always too much the fashion, with us, to find the occasion for the knowledge first, and to let the knowledge come after, as it may. When the at-all in the story was asked, "Can you play on the fiddle?" his answer was, "I don't know, but I'll try;" and so with our engineering aspirants, the rule has been, first to get a dock or harbour to do, and afterwards to find out how it is to be done. And though now and then, some egregious blunder will occur, to furnish its instructive commentary on this inversion of the proper order of things, it must be confessed that, in general, its worst effects are to be traced in that excess of expenditure over estimate, for which English engineers have become almost quite as

* A Treatise on the application of Marine Surveying and Hydrometry to the Practice of Civil Engineering. By David Stevenson, C.E. Pp. 174. Royal 8vo., with 13 Plates. A. and C. Black, Edinburgh. Weale, London.

* *Hydraulics*, in its common acceptation, includes every thing mechanical having any relation to water, from the huge breakwater erected to oppose the inroads of the ocean, down to the garden watering pan: but strictly speaking, it relates only to the motion of water in pipes, being compounded from ὕδωρ, water, and αυλος, a pipe. Would not *Hydriatics* be a better term, and square well with *Pneumatics*? Hydraulics might then be restricted to its original signification—reduced to its proper rank, which is that of a General of Division, while *Hydratics* would become, by right of suffrage, the true Generalissimo.

famous as for the excellence of their constructions.

We are accustomed to hear all sorts of reasons assigned for such excesses—unfavourable seasons, "accidents by flood and field," extra works, &c.—but the reason which is more potent than all—the *trying* to play on the fiddle before learning—is but rarely glanced at, or if occasionally urged by some obstinate malcontent, only to be drowned by a flourish of trumpets from the successful engineer and his friends. It would not, perhaps, be straying far from the truth, were the item which now stands as "contingencies" in most estimates for public works, expunged, and the following inserted in its place—"*To education of the engineer*," 100,000*l*. or 1,000,000*l*. as the case may be.

It is but one of the natural results, or rather types of this state of things, that there should be such a paucity of works, in our language, on hydraulic engineering. Where there are so few learners there cannot be many teachers. To even the most rudimental and essential parts of the art or science, there are either no guides, or none that are trustworthy. The making of soundings, sections and borings, tidal and hydrometrical observations, are, for example, things of the first necessity; but how to make them, none of our authors have been at the pains to show, explicitly and fully. A desire to supply—so far—the great existing deficiency in this branch of our scientific literature, has led to the production of the work before us.

The author, Mr. Stevenson, is already favourably known to the public by his clever and instructive "Sketch of the Civil Engineering of North America." In his present work we have some of the fruits of his own engineering practice. "The observations," he says, "contained in the following chapters, have been thrown together at intervals of leisure from more urgent duties, and are chiefly the result of a pretty extensive experience obtained in the course of surveys, which were either at an early period conducted by myself, or have latterly been made under my directions." It would be well for the world, were all learned leisure employed to as good purpose. A work of more extensive practical utility, more certain to bring honour to its author and confer lasting benefit on his profession, has seldom come under our notice.

As the series of operations necessary in the survey of a river, embrace almost every point of consequence in the general application of surveying and hydrometry, to the practice of hydraulic engineering, Mr. Stevenson judiciously makes them the principal object of his attention; supplying, as he proceeds, those further explanations, which are occasionally necessary with respect to the surveys of harbours or lines of coast. The subjects treated of in succession, and each with great particularity of detail, are Triangulation—The Base Line—Tidal Observations—Soundings—Low Water Surveys—High Water Margin Surveys—Cross Sections and Borings—Hydrometrical Observations (on the Discharge and Velocity of Rivers, Qualities of Water, &c.)—Protraction of the Triangulation, Base Line, and Traverse Survey—and Protraction of Low Water Survey and Soundings. The work is not of a nature to afford much quotable matter, nor is it easy, by any quotation, to exemplify the value of the information which it contains; but the following extracts will at least serve to show that it is not deficient either in originality or novelty.

Local Variation of the Magnetic Needle, a frequent but neglected source of Error in Surveys.

"The magnetic needle, independently of those changes which are ascertained to be constantly going on in its direction and dip, to which the term "variation" has been applied, is subject to other variations occasioned by local attraction, in consequence of which, it has, under certain circumstances, been found, that, in surveys even of limited extent, the magnetic north, as indicated by the needle, varies in its direction to a very appreciable amount at different stations. The causes of these variations are in some cases very apparent, but in others they are not so easily discovered, and therefore cannot be so well guarded against. I have met with many instances of errors in observations produced by local variation, some of which have given rise to considerable trouble, before the cause from which they proceeded could be detected. On the river Tay, for example, I found the variation on one occasion to amount to 2° 30′ in a distance of about a quarter of a mile. The first of the series of observations by which this local variation of the needle was discovered, was made on the top of a high bank, about 50 feet above the level of

the water, and the second on a low tide covered sandbank in the middle of the river; but the attracting influence could not, in this case, be satisfactorily ascertained. On another occasion, an error, amounting to no less than 7°, was introduced into the bearings of a survey, in consequence of certain observations which had been referred to the magnetic north having been made in the vicinity of a large steam boiler, which lay concealed from view in a warehouse, close to which the instrument had been set, and the influence of this mass of iron on the data of the survey, could not, at the time the observations were made, be avoided. In another instance an error of 2° was in like manner introduced into a harbour survey, owing to the instrument having been inadvertently set too near a cast iron mooring pall which was fixed on one of the quays.

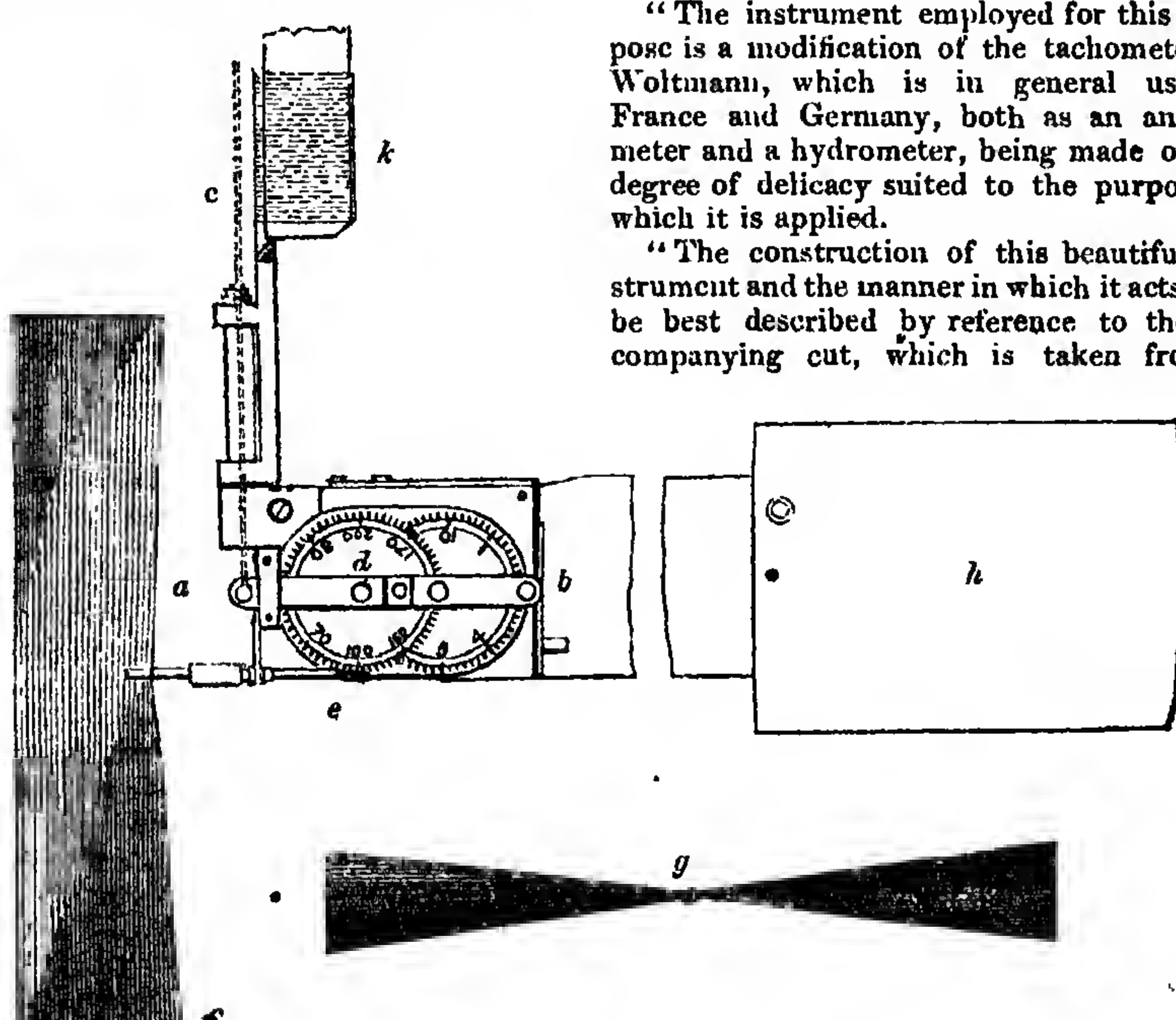
The Datum Line for Soundings.

"It is evident that all soundings must be reduced or referred to one datum line, before a correct notion can be formed of the depths of water at the places where they were taken. Different opinions have been advanced as to the most convenient datum to be used for this purpose. When the whole rise of the tide can be observed, which is the case in harbour surveys situated on the coast, the 'half tide mark,' or that central point from which the high and low water levels of every tide are very nearly equidistant, is a convenient point for referring to. The existence of such a point 'equidistant from the high and low water of any one tide and on the same level, or coinciding with the points half way between high and low water of every other tide,' has been determined by observations made in several situations. It is believed to have been first detected in 1830 by my father, while surveying the Dornoch Frith in reference to a salmon fishing question, and is particularly alluded to in his report to the Court of Session on that subject, dated 31st January, 1831. In 1833 it was found to exist in the Frith of Forth, in making the tide observations for a harbour survey; and in 1834, in surveying the Skerryvore Rocks on the west coast of Scotland, with a view to the erection of the Skerryvore Lighthouse. In 1835, I obtained the same results at the Isle of Man; and in the same year Captain Denham brought a similar result, obtained from extensive observations made at Liverpool, before the meeting of the British Association, held at Dublin. The agreement of these different series of observations, made at points so far distant from each other, seems to prove the universality of the phenomenon, at least on the shores of this country."

Instrument for Measuring the Velocity of Water.

"The instrument employed for this purpose is a modification of the tachometer of Woltmann, which is in general use in France and Germany, both as an anemometer and a hydrometer, being made of the degree of delicacy suited to the purpose to which it is applied.

"The construction of this beautiful instrument and the manner in which it acts, will be best described by reference to the accompanying cut, which is taken from a



tachometer or stream gauge made by Mr. Robinson, optician, London, and is drawn to a scale of one-third of the full size. In this view *f f* represents what may be termed a driving vane, which is acted on by the stream, and of which *g* is a plan. The plane of this vane is twisted, as represented by the dark shading in the cut, so as to present, not a knife edge, but an oblique face to the action of the current, which by impinging on it, causes it to revolve exactly in the same way that the wind propels the sails of a windmill. On the spindle or shaft of this vane an endless screw is fixed at *e*, which works in the teeth of the first registering wheel, and causes it to revolve, when the vane is in motion and the screw in gear. Letters *a* and *b* represent a bar of brass, to which the pivots on which the registering wheels revolve are attached. This bar is moveable on a joint at *b*; and at the point *a*, a cord *c* is fixed, by pulling which the bar and wheels can be raised, and on releasing it they are again depressed by a spring at *d*. When the bar is raised, the teeth of the wheel are taken out of gear with the endless screw, and the vane is then left at liberty to revolve, the number of its revolutions being unregistered; but when the cord is released the spring forces down the wheels, and immediately puts the registering train into gear, in which state it is represented in the cut. Letter *h* is a stationary vane (which is shown broken off, but measures about 9 inches in length) for keeping the plane in which the driving vane revolves, at right angles to the direction of the current, and *k* is the end of a wooden rod to which the tachometer is attached when used. The different parts of the instrument itself are made of brass.

"The moveable bar for the registering wheels and the application of the cord and spring which have been described, afford the means of observing with great accuracy, in the following manner. The instrument having been adjusted by setting the registering wheels at zero, or noting in the field book the figure at which they stand, the cord is pulled tight so as to raise them out of gear, and the instrument is then immersed in the water. The vane immediately begins to revolve from the action of the current, and is permitted to move freely round until it has attained the full velocity due to the stream. When this is supposed to be the case, a signal is given by the person who observes the time, and the registering wheels are at that moment thrown into gear by letting the cord slip. At the end of a minute another signal is given, when the cord is again drawn and the wheels taken out of gear, and on raising the instrument from the water the number of revolutions in the elapsed time is read off. This operation being completed in the centre of each division of the cord, the number of revolutions due to the velocity at each part of the very line where the cross section is taken, is at once obtained.

"Before using the tachometer, it is obvious that the value of a revolution of the vane must be ascertained; and although this is done by the manufacturers, it is proper that the scale of each instrument should be determined by the person who uses it, and that it be tested if the instrument has been out of use for some time, before being again employed in making observations. A scale sufficiently accurate for most hydrometrical purposes, (though not for the instrument when used as an anemometer,) may be obtained by applying it to some regular channel, such as a mill lead formed of masonry, timber, or iron, where the velocity is nearly the same throughout, and noting the number of revolutions performed during the passage of a float over a given number of feet, measured on the bank. In this way, it was found, by the mean of sixty-two observations, that each revolution of the vane in the instrument of which a drawing has been given, indicated the passage of the water over forty-six inches. The number of revolutions at several parts of the stream was ascertained to be the same in equal times, at both the commencement and the end of the experiments. This number, therefore, becomes in the instrument alluded to, a constant multiplier of the number of revolutions indicated by the vane; and hence, the number of feet passed over by the water in the given interval of time, is ascertained."

Instruments for obtaining Water from different Depths.

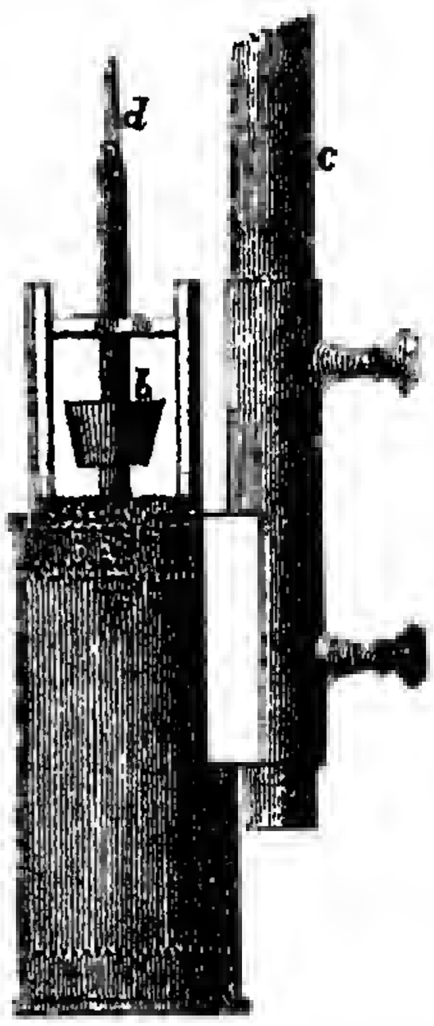
"Instruments of various constructions have of late been tried for experimenting on this subject, by Scoresby, Sabine, and others; and as I am not aware that any work on marine surveying, or on surveying instruments, contains a description of such an apparatus, (to which I have applied the name of the *hydrophore**,) the following account of two modifications of it, both of which I have been in the habit of using, may perhaps be instructive.

Fig. 1. represents a hydrophore used for procuring specimens of water from moderate depths, drawn on a scale of one-tenth the full size. It consists of a tight tin cylinder, letter *a*, having a conical valve at its top, *b*, which is represented in the diagram as being raised for the admission of water. The valve

* ὕδωρ and φορεω.

is fixed *dead* or immoveable on a rod working in guides, the one resting between two

Fig. 1.



uprights of brass above the cylinder, and the other in its interior, as shown in faintly dotted lines. The valve rod is by this means caused to move in a truly vertical line, and the valve attached to it consequently fills or closes the hole in the top of the cylinder, with greater accuracy than if its motion were undirected. A graduated pole or rod of iron, *c*, which in the diagram is shown broken off, is attached to the instrument, its end being inserted into the small tin cylinder at the side of the large valve or water cylinder, and there fixed by the clamp screws shown in the diagram. The bottom of the water cylinder may be loaded with lead to any extent required for the purpose of causing the apparatus to sink; but this, when an iron rod is used for lowering it, is hardly necessary. The spindle carrying the valve has an eye in its upper extremity, to which a cord is attached, for the purpose of opening the valve when the water is to be admitted, and on releasing the cord it again closes by its own weight. When the hydrophore is to be used, it is lowered to the required depth by the pole, which is fixed to its side; or if the depth be greater than the range of the pole, it is loaded with weights, and let down by means of a rope so attached as to keep it in a vertical position. Care must be taken, while lowering or raising it, that the small cord by which the valve is opened, be allowed to hang perfectly free and slack. When the apparatus has been lowered as far as is required, the small cord is pulled, and the vessel is immediately filled with the water which is to be found at that depth. The cord being then thrown slack, the valve descends and closes the opening, and the instrument is slowly raised to the surface by means of the rod or rope, as the case may be, care being taken to preserve it in a vertical position. This apparatus is only applicable to limited depths, but will generally be found to answer all the purposes of the civil engineer.

The form of hydrophore represented in fig. 2, is used in deep water, to which the small one, just described, is inapplicable.

Fig. 2.

It consists of an egg-shaped vessel, letter *a*, made of thick lead, to give the apparatus weight, having two valves, *b* and *c*, one in the top and another in the bottom, both opening upwards; these valves (which are represented as open in the diagram) are, to ensure more perfect fitting, fixed on separate spindles, which work in guides in the same manner as in the instrument shown in fig. 1. The valves, however, in the instrument I am now describing, are not opened by means of a cord, but by the impact of the projecting part *d*, of the lower spindle on the bottom, when the hydrophore is sunk to that depth. By this means the lower valve is forced upwards, and the upper spindle (the lower extremity of which is made nearly to touch the upper extremity of the lower one when the valves are shut) is, at the same time, forced up, carrying along with it the upper valve, which allows the air to escape, and the water rushing in, fills the

vessel. On raising the instrument from the bottom, both valves again shut by their own weight, and that of the mass of lead, *a*, which forms part of the lower spindle. The mode of using this hydrophore is sufficiently obvious; it is lowered by means of a rope made fast to a ring at the top, until it strikes on the bottom, when the valves are opened in the manner described, and the vessel is filled; on raising it the valves close, and the vessel can be drawn to the surface without its contents being mixed with the superincumbent water through which it has to pass. This instrument weighs about half a hundred weight, and has been easily used in from thirty to forty fathoms water in making engineering surveys, and could no doubt be employed for much greater depths, if necessary. It is represented in the cut on a scale of one-twentieth of the full size."

In an Appendix to the work, the author gives a useful Abstract of the Standing Orders of the Houses of Lords and Commons, with respect to Bills for making, maintaining, varying, extending, or enlarging Canals, Reservoirs, Aqueducts, Water Works, Navigations, Harbours, Docks, &c.

THE DOUBLE ACTING ROTARY ENGINE AFFAIR—AGAIN.

Since we plucked from the mock crown of this scheme, the only false gem that was likely to *dazzle* the public, the projectors have, with a very proper discretion, thrown it aside as a thing no longer of any use. A new prospectus has been put forth *without the names of any persons as Directors*. The only individuals who now appear as sponsors for the scheme are "Edward Lomax, Esq.," (the "eminent") who enacts the part of "engineer," and "Hyppolytus de Mancel, Esq.," who does that of "Secretary." Even the Count de Predaval, of the Austrian Imperial service, who was stated to be the inventor of the "double-acting" wonder of wonders, no longer figures—by name at least—on the scene. The "Patentee and promoters"—that is to say, Messrs. Lomax and de Mancel, for and on behalf of the "patentee and promoters," whoever they may be, and wherever they may dwell, (Hanwell, Hoxton, or St. Luke's,) now "give notice that they are ready *to contrac* fo supplying parties or companies with *warranted* double-acting rotary engines," at the following rates per horse power: "Stationary engines, acting by cold water or *melted lead*," 30*l.*, "mercury included"—"marine and locomotive engines acting by cold mercury, kept quite harmless," 40*l.* and 50*l.* (the "melted lead" is a new feature—what it means we really have no idea.) Of these "ere trifles" there is to be paid "*one half on delivery*, the other half three months after;" and lest any doubt should arise as to whether the "one half," and the "other half" make one whole between them, there is a positive assurance added, that the two halves mean "all included." Who can doubt of the willingness of the parties to *contract* on such terms for any number of engines they can receive orders for—aye and to *warrant* them too? Engines equal to 1000 horses power (if of any) would not cost twice as many pounds—so mighty simple a thing it is! but the "one-half on delivery" at an average of 35*l.* per horse power would produce 35,000*l.*, leaving a net sum in pocket of 33,000*l.*! Not, of course, to be *run off* with—that we are far from insinuating—but to constitute a guarantee fund, of which Messrs. Nobody, Brothers, and Co., or some other equally substantial firm, (yet to be appointed) will be the "bankers;" for *of course* "the company" will not think of making any dividends till "the three months after" have tested the worth of the machines delivered. But the order—the actual order—for the 1000 horses power—what likelihood is there of that? Not much, we should say, were the rationalities of the case only to be looked at in a rational spirit; but John Bull is notoriously an exceedingly gullible personage, and Messrs. Lomax, Hippolytus de Mancel, and Co., are persons of exceedingly imposing ways. In spite of our exposure of the gross absurdity of this "double-acting rotary" affair—in spite of its palpable impracticability, we observe that Mr. Lomax persists in the new prospectus without directors, in assuring the public, "upon his professional reputation," that "the invention is an *ingenious, practicable, efficient*, and *economical* arrangement of machinery, founded on *scientific principles*, and an *adaptation of the immutable laws of nature to the wants of man*," *&c. &c.*, and that Mr.

Hippolytus de Mancel persists with equal bravery in certifying that the author of the said very ridiculous assertion is no fool, but one of "several *eminent* engineers," who have examined the new system, and are perfectly qualified to judge of its merits! *Par nobile fratrum!* the one as "eminent" as the other is veracious, and both as innocent of all intention to do wrong, as their conduct is free from every appearance of humbug and quackery!

HOBLYN'S MANUAL OF THE STEAM ENGINE.*

We are free to admit that notwithstanding the number of books which have been already published on the Steam Engine, there is still room for a much better than has yet appeared; and are willing also to concede to the author of the "Manual" before us, that what is most wanted, is that which he has attempted, namely, the reduction of the abundance which has been written on the subject into a "popular" form. But mere indiscriminate recompilation and recopying is not to our minds improvement; neither do we see how a book which throws no new light on a subject can be said to make it any clearer, or by virtue of greater clearness, more "popular" than it was before. Mr. Hoblyn appears to us to have left the history, theory and practice of the steam engine just where he found them; with every ancient error preserved, not a single difficulty cleared up, and chaff and grain intermingled and confounded just as much as ever.

Mr. Hoblyn, as most other writers on the steam engine have done, makes Hero's engine his starting point. He gives an engraving of (what is said to be) it, copied from Lardner, who probably copied it from some one else, and describes it also in nearly the same words —which, in the hope that what we have to remark on them, may prevent them, from being repeated again, we shall here quote:

"About 120 years before the present era, an elegant machine was *constructed by Hero of Alexandria*, in which a rotary motion was produced by means of steam. A hollow globe, placed on pivots, was furnished *with a number of horizontal tubes radiating from it like the spokes of a wheel*, and closed at the extremities, with the exception of a small orifice near the end, and on the side of each tube. The globe being supplied with steam the fluid rushes through the orifices with a force *equal to the excess of its elasticity over that of the atmosphere*. The recoil produced by this difference of pressure repels the tubes in the opposite direction, and a rotary motion is produced, which may be communicated to machinery connected with the globe," p. 20.

Now, in the first place, Hero (whose *own* account of the affair we have now before us) does not say that it was "constructed" or invented by him. He gives it, on the contrary, as one of many pneumatic contrivances well known in his time. Secondly, the engine, as figured and described *by Hero himself*, has but two arms; the round dozen given to it in the engraving common to Lardner and Hoblyn, is an absurdity of modern invention, of which Hero was too good a mechanician to be guilty. And, thirdly, *Hero himself* assigns no such cause for the action of the engine as the force of the steam issuing from the orifices being "equal to the excess of its elasticity over that of the atmosphere;" he probably knew that it would act just as well with no atmosphere at all to act against, for there is prefixed to his "Spiritalium" a preliminary essay "of vacuum," which shows that he had not, even at his early day, a great deal to learn on the subject.

Hero's engine is pronounced by Mr. Hoblyn (as by others before him) to be but an "ingenious toy;" but there are at this very time several engines doing good work in England, which act precisely on the principle of that toy, and vary from it only in details, in which it is easier to recognize a difference than a distinction. We allude particularly to those erected under Mr. Craig's patent. We do not say that these engines do better work than others, or as good; these are points on which we do not feel called upon to offer any opinion here; but we cite the fact of a certain useful effect of considerable amount being now daily obtained from engines on this plan, to show that it deserves at least a far more honourable place than Mr. Hoblyn, and others of his superficial class, have been pleased to assign to it. And this we are the more induced to do because Mr. Hoblyn himself takes no notice at all of these "modern instances;" except it be to

* A Manual of the Steam Engine. By Richard D. Hoblyn, A.M. Oxon. 294 pp. 12mo, with numerous engravings. Scott, Webster, and Geary. London.

repeat (in the parrot style, which characterizes the whole of his book) the objections of Mr. J. Scott Russell to all rotary engines whatever, without attending to the fact that sweeping as these objections are, Mr. Russell admits that they resolve themselves more into difficulties of a mechanical nature (and therefore not *impossible* to be overcome) than into any absolute fallacy in principle.

The invention of the cylinder and piston Mr. Hoblyn ascribes to Newcomen and Cawley—only repeating again in this what others have said before him. If he will take the trouble to refer to the "Spiritalium," Art. xxvii., he will find that with regard to these, also, the toyman Hero had anticipated the Devonshire tradesmen by near two thousand years.

The subject of Steam navigation occupies a large space of Mr. Hoblyn's volume—and deservedly so; but the proportion of that space, (nearly one-third) devoted to Mr. Samuel Hall's condensing apparatus (to say nothing of the double-leads!) stands in strange contrast with the actual position of that invention at the present time. It looks more like a puff or advertisement done to order than any thing else. Mr. Hoblyn seems to be wholly unaware of the fact that the mode of condensation which he lauds so highly has, after full trial, been almost universally abandoned.

In an Appendix to his book, Mr. Hoblyn devotes about a dozen pages to the very *relevant* subject of "Causes and Prevention of slips or falls of Earth from the Slopes of Excavations on Railroads." What such things have to do in a "Manual of the Steam Engine," Mr. Hoblyn leaves his readers to guess. Had they been *original*, we should have concluded that they were intended to show that he *could* do something in that line,—the manifestations to the contrary in the body of his work notwithstanding; but it so happens that they also are borrowed, and borrowed from a contemptible source which nobody else would think of quoting.

ON LIMES AND CEMENTS—MR. FROST'S EXPERIMENTS—COL. PASLEY'S TREATISE.

Brooklyn, New York, June 1, 1841.

Sir,—It may be known to you, as well as to many of your readers, that some years ago I expended a vast deal of time and money in attempting to improve the theory and practice of forming better limes and cements than were previously known, and that I fully succeeded in producing better limes, cheaper and better looking cements. But it may not be so generally known that I met with a circumstance as mortifying as it was vexatious, namely, that I could produce on a small scale, but never on a large scale, a cement exceedingly preferable to all others for architectural purposes, being of a fine white, or greyish white colour, while all other cements previously produced were of a very disagreeable, if not odious colour. From the chemical constitution of this cement, I know it to be also impenetrable, its hardness exceeding that of all others, none of which ever equal the hardness of good statuary marble, while I have specimens varying from three, to nearly six times the hardness of that expensive and beautiful material. This new cement, therefore, stood unrivalled in these several respects: First, it was imperishable in the air, or rather rain of London, which, loaded with carbonic gas, speedily destroys or dissolves all calcareous carbonates, as the marble statue of Queen Anne, in front of St. Paul's Cathedral, wearing its second or third head, effectually demonstrates. Second, it possessed immensely greater hardness. And third, it was perfectly plastic, a consideration as much beyond all computation, as the tedious and expensive labour of the statuary is to the rapid and inexpensive work of the modeller.

I have now the pleasure of informing you, that patience and science conquered the difficulty that so long opposed my attempts to produce this good thing on a large scale and at a cheap rate, and that I can send from this country white cement possessing all the properties before specified, or instruct any persons desirous of engaging in the manufacture in England, where the materials abound.

There have been many treatises written on cements in France, England, and other countries at various times; but a really good and comprehensive one remains yet to be written. All who have yet undertaken the task have taken much too narrow views of the subject, and it will be hereafter a matter of much wonder how the deuce, any of them could have been satisfied with the little they know about it.

It is but a few days since I saw Colonel Pasley's elaborate work on ce-

ments, and cannot yet say which is most to be admired, his immense satisfaction with his immense discoveries, or his profound contempt for all other writers of all other countries. Witness his remarks on Hamelin's patent mastic cement, page 35, Article xxxiii. of his Appendix. "This very ingenious composition, which forms an excellent stucco, shall be noticed here, *though invented by a Frenchman.*" What amazing condescension in the learned Colonel!

From Colonel Pasley's work it would seem as if he were acquainted with the life, birth, and parentage, of every person who has ever cemented, yet in this one instance, at least, had his scientific reading been only equal to his national prejudices, he might have spared himself the trouble of this passing compliment to "the Frenchman," for true it is that the same cement had been invented in England a century before Hamelin's time—had been actually patented under the same quaint name of *Mastic*, and had been the subject of suits of law for infringement of the patent, &c., &c.

I should like, by the way, to be informed whether there is any of this old mastic plaster now to be found in England of the age of a century, because, if there is not, the fact will prove it to be a substance of no great durability, and furnish a caution against its renewed use.

The contempt of Frenchmen, shown in the above extract, however natural in the noble Colonel, seems rather inconsistent at this time of day, when England and France have become wise enough to be friends, and the more so, considering that the Colonel, in his compilation (which he has mistaken for knowledge) has occupied no less than twenty-eight pages of his work in copying M. Vicat's treatise on limes, published twelve years since; and forty-one pages of his work in copying M. Tredescant on the same subject.

As writing a large book is considered by many a proof of great erudition, and as the writing of a book on a learned subject may by many be mistaken for great proficiency in the science of which it treats, and as the matters embraced in the Colonel's work are of very great importance,—as he has made himself much more free than welcome with my name, and with my works, which he has in many cases grossly misrepresented, from not understanding them, I send you this letter as the first of two or three, in which I intend to show the numerous mistakes the Colonel has made, and to do my best to place the whole subject in a better light.

That more information is needed—that more information will be useful—that if nothing more than a classified statement of the knowledge already generally possessed were published, many ignorant and absurd attempts at improvement would be prevented, and many and large improvements in building become of easy and certain attainment—all must readily allow. An amazing proof of this has been furnished in England, in the late prodigious attempt to improve calcareous cements by cookery instead of chemistry.

I shall address you in continuation at an early day. Give me but a fair hearing before my country; I have sins enough without misrepresentations, to answer for; and it will be seen hereafter, that to misrepresent what I have done, is to do what neither you, nor your numerous readers, will, I am sure, ever willingly do,—misrepresent the cause of science.

I am, respectfully, dear Sir, yours,

JAMES FROST.

STEAM BOILER EXPLOSIONS—SUGGESTION FOR THEIR PREVENTION.

Sir,—I believe it is generally understood that the explosions of steam boilers are occasioned by hydrogen or some other gases accumulating and mixing with the steam in the boilers; at least, that some kind of explosive mixture takes place, by which the boilers are burst,—the boiler valves not acting at times properly, or not opening sufficiently to allow of the escape of the mixed vapours or gases into the open air. If so, would it not be a good plan to blow a steady stream of air heated to the most suitable degree, into the boiler, and downwards upon the surface of the water? A valve should of course be affixed to the boiler to discharge the air again from the boiler; that valve being fixed upon a principle of continued action. Perhaps the valve should be kept in action by the engine itself. The hot air would not only purify the boiler of all foul gases, but would accelerate the generation of the steam. I am, yours, obediently,

THOMAS DEAKIN.

Blaenavon, April 7, 1842.

NAYLOR'S APPARATUS FOR INCREASING THE ILLUMINATING POWER OF COAL GAS.

Fig. 1.

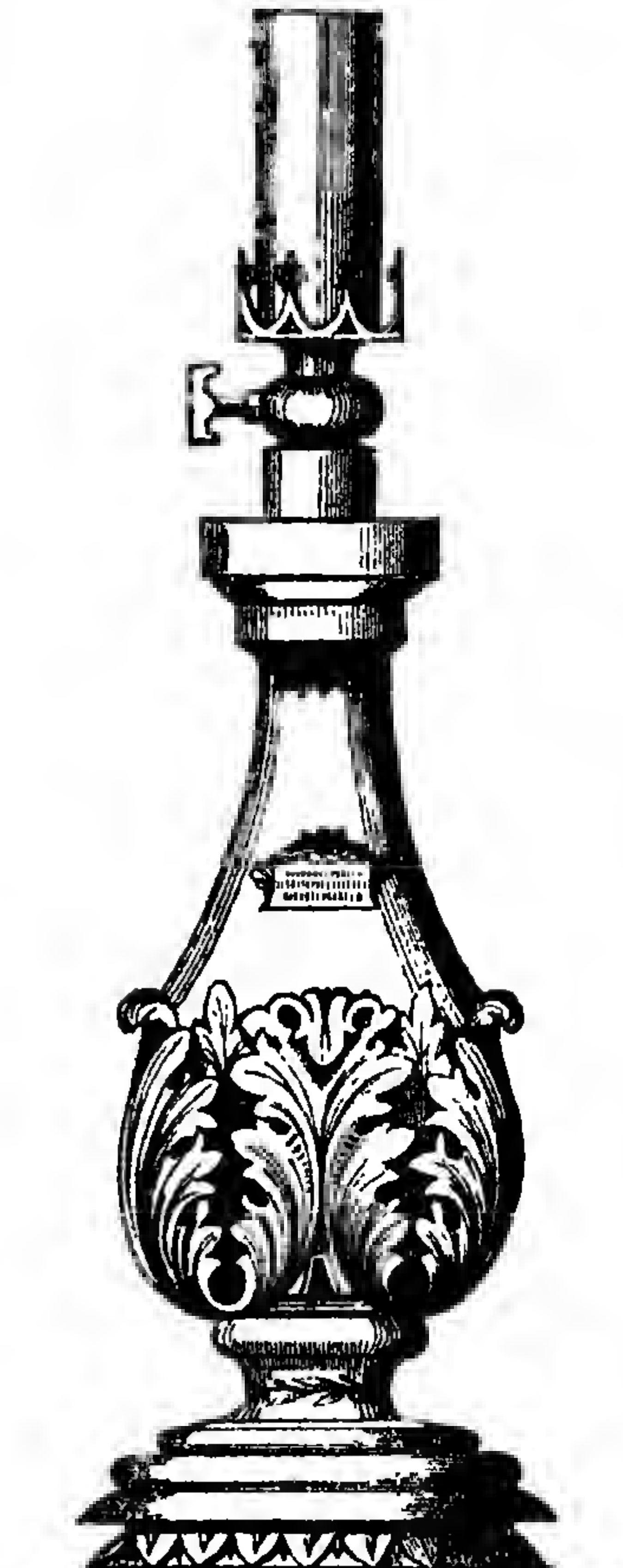
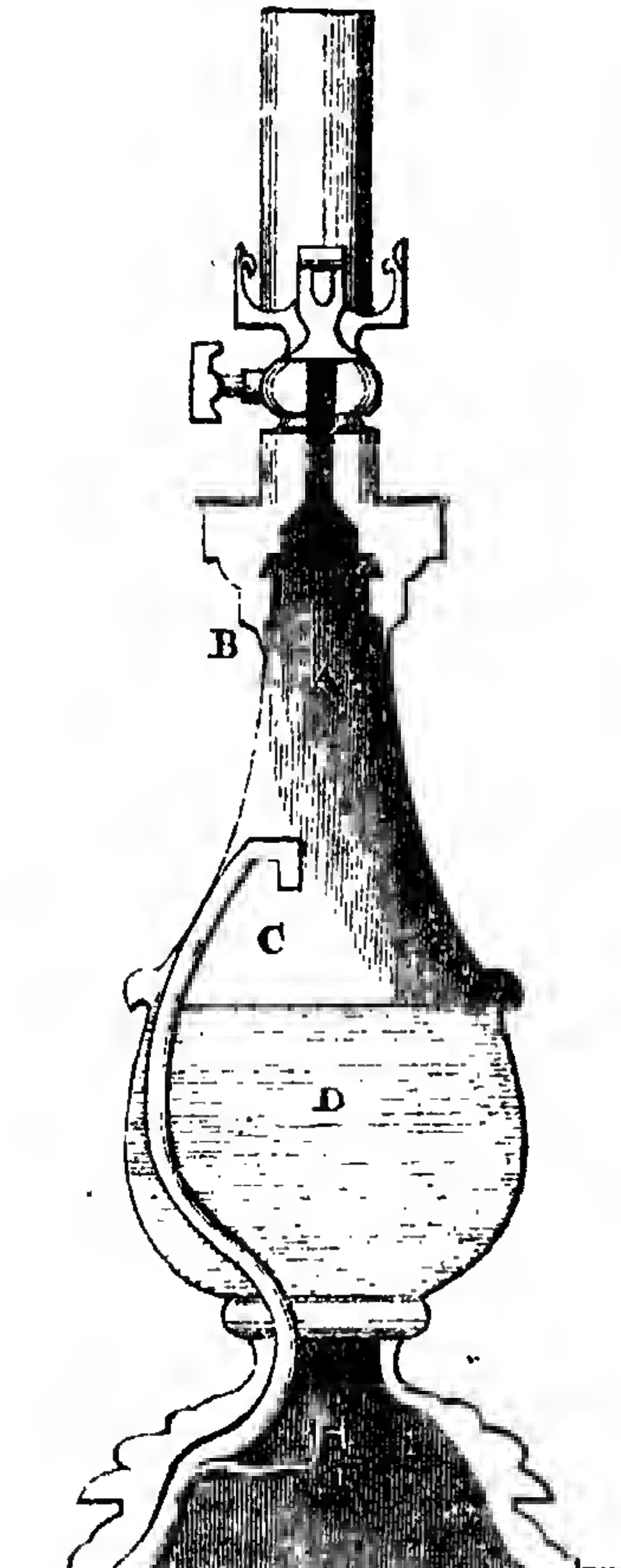


Fig. 2.



Sir,—I send you a drawing and description of a new piece of apparatus for increasing the illuminating power of coal-gas, which I hope you will insert. Chemists have all allowed that carburetted hydrogen owes nearly all its illuminative power to the accidental admixture of a certain oily vapour which is given off during the decomposition of the coal in the retorts; being aware of this, it occurred to me that if the gas could be more strongly impregnated with a similar compound, the flame would be increased in intensity, which I afterwards found to be the case. The apparatus consists of a brass reservoir or chamber A, attached to the end of the gas-pipe near the burner. This reservoir may be in the shape of an oil-flask, made air-tight, with a screw-joint B, or other means for supplying it with any highly volatile oil, as turpentine, mineral naphtha, or the hydro-carburets, and should be kept about half-full. Into this reservoir the common gas-pipe C, ascends a little above the oil D; a very small jet-pipe is branched off below this chamber at E for the purpose of applying thereto a minute gas flame, so as to cause a sufficient evaporation from the oil to unite with the gas previous to its being

consumed. The whole is of course surmounted with the usual burner and lamp glass.

By employing this apparatus for burning coal-gas, the intensity of the flame will be very considerably augmented; consequently the same degree of light may be obtained with a far less consumption of gas, a point which I consider of some importance. It may be also employed for burning those varieties of gas obtained by the decomposition of several of the species of anthracite, bituminous earths, wood, &c. which could not be otherwise employed with any advantage for the purpose of illumination. And should ever voltaic electricity be extensively used as a motive power, the large quantities of pure hydrogen, evolved from the copper or platinum plates of the battery, might be collected and effectively consumed by the new apparatus.

In conclusion, I may remark that the apparatus, from the simplicity of its construction, might be manufactured at a very trifling cost, possessing likewise the advantages of being very compact and neat in appearance.

I am, Sir, your obedient servant,

T. W. NAYLOR.

April 3, 1842.

NATURAL PHILOSOPHY FOR BEGINNERS.*

We cordially recommend to all beginners in the study of Natural Philosophy —whether young or old—a little work which has been recently published under the above title. It was originally intended as an explanatory accompaniment to an excellent set of educational models (of the Mechanical Powers, Geometrical Solids, Architectural Solids, &c.) manufactured and sold by Messrs. Taylor and Walton, the publishers of the work; but during its progress through the press, it gradually assumed its present enlarged form of a complete treatise on the mechanical powers, illustrated by reference to diagrams as well as models. The author has executed his task with ability. His descriptions are exceedingly simple, clear, and intelligible; and his demonstrations of principles such as any person with a knowledge of common arithmetic, may readily comprehend. As a Text Book for Schools, or a *vade-mecum*, to persons who must instruct themselves, we know of nothing better in our language. We select a couple of specimens:

The Wedge.

"There is scarcely any instrument whose applications are more numerous than those of the wedge; chisels, nails, awls, needles, axes, sabres, &c., all act on the principle of the wedge. It is also used in a variety of cases where the other mechanical powers would be of no avail. This arises from its being driven principally by *impact;* the momentum of the blow is consequently much greater in comparison to the application of the pressure of the lever. As an example of the enormous power of the wedge, it may be stated that the largest ships when in dock may be easily lifted up by driving wedges under their keels. It has sometimes happened that buildings—such as a heavy chimney for a furnace—have been found to incline, owing to the dampness of the foundation, and have been restored to their perpendicular position by wedges driven under one side. It is sometimes used in splitting rocks, which it would be impossible to effect by the lever, wheel and axle, or pulley; for the force of the blow or stroke shakes the cohering parts, and makes them separate more easily. In some parts of Derbyshire, where mill-stones are obtained from the siliceous sand-rocks, wedges made of dry wood are driven into holes bored round the piece of rock intended to be separated from the mass; these wedges gradually swell by the moisture of the earth, and in a day or two lift up the mill-stone without breaking it. Builders, in raising their scaffolds, always tighten the ropes round the scaffolding-poles by means of wedges driven between the cords and the poles.

"A knife may be considered as a wedge, when employed in splitting; but if the edge be examined with a microscope, it is seen to be a fine saw, as is evident from the much greater effect all knives produce by being drawn along the materials against which they are applied, than what would have followed from a direct action of the edge.

"It appears from the results of some

* Natural Philosophy for Beginners. Being Familiar Illustrations of the Laws of Motion and Mechanics. Intended as a Text Book for Schools and Self-Instruction, as a Companion to the Lecture Room, or for Model Schools. Illustrated by 143 engravings on wood. 127 pp. 32mo. London, Taylor and Walton.

experiments made in the dockyard at Portsmouth, on the comparative effect of driving and pressing in large iron and copper bolts, that a man of medium strength, striking with a mall weighing 18 pounds, and having a handle 44 inches in length, could start or drive a bolt about one-eighth of an inch at each blow, and that it required the direct pressure of 107 tons to press the same bolt through that space; but it was found that a small additional weight would press the bolt completely home."

The Screw.

"The uses of the screw are innumerable. It is used in coining, where the impression of a die is to be made upon a piece of metal. It is also employed in taking off copper-plate prints, and for printing in general. By its aid a large bale of cotton is condensed into a small package, and from being the lightest and most buoyant of substances, becomes dense enough to sink in water. Sometimes buildings are raised from an inclined to a vertical position, by means of a small screw, acted upon by a comparatively small force. It is also of great utility in astronomical calculations, by affording an easy and very exact method of measuring or subdividing small spaces. An ordinary screw will divide an inch into five thousand parts; but the fine hardened steel screws which are applied to the limbs of astronomical instruments, will go much further. In this case it is called a *Micrometer screw*, from the Greek μικρὸς, little, and μέτρον, a measure. The *gimlet* and *auger* are examples of the screw, both of which may be considered as an inclined plane wrapped round a *cone* instead of a *cylinder*. The power of these instruments is very much increased by their terminating in a point. When liquids or juices are to be expelled from fruit or vegetables, the screw is generally used. The cider press is an example of this machine, so applied; and in cases where great pressure is required, the power of the screw is often employed.

"It is not unfrequently used in flour mills for pushing the flour which comes from the mill-stones to the end of a long trough, from which it is conveyed to other parts of the machinery, in order to undergo the remaining process. In this case the spiral threads are very large, in proportion to the cylinder on which they are fixed. A common corkscrew is the thread of the screw without the spindle, and is used not to correct opposing forces, but merely to enter and fix itself in the cork. Complicated corkscrews are now made, which draw the cork by the action of a second screw, or of a toothed rod or rack and pinion."

VELOCIPEDES—A FEW PRACTICAL HINTS.

Sir,—I have read with much pleasure Mr. W. Pearson's description of his design for a "velocipede," (No. 968,) and as I have been cogitating for some time on the same subject, namely, the applying motive power for carriages (whether that power be manual labour, steam, or other agent) to propellers, to be brought in contact with the ground instead of the cranked axle of the bearing wheels, I may perhaps be allowed to offer some remarks on your ingenious correspondent's suggestion.

I think Mr. Pearson is in error in proposing wheels of so large diameter as 8 feet. Such wheels would be monstrously unwieldy, and the leverage to be overcome would more than counterbalance any supposed advantage to be derived from them. Instance Mr. Brunel's experimental ones on the Great Western Railway, which he was obliged to abandon from the cause stated. I should say that 5½ or 6 feet is the utmost practicable limit for wheels of such a carriage; still retaining, however, the full diameter of 3 feet for the guide-wheel. I think that in general, guide-wheels are disproportionably small. The power expended in lifting the guide-wheel, and all the apparatus at the fore frame of the carriage by every action of the propellers, would detract considerably from the advantages otherwise derivable from them. The simple remedy for this would be to have the propellers 2 or 4 in number affixed to an axle, with the same number of cranks underneath the body of the carriage, leaving the guide-wheel at liberty to apply itself to the use which its name indicates. These propellers should be directed backward at such an angle as practice may determine to be best; and there should be an adjustive apparatus for inclining them to any degree found most convenient, or rather efficient, to counteract shocks. In order also that they may adapt themselves to the inequalities of surface, each propeller should be provided with a spring of strength sufficient to bear a moderate degree of pressure, and which, on meeting with any obstacle, would bear a compression of 3 or 4 inches. This spring might be placed in any part of the

propeller—perhaps the best position would be at the top, uniting the propeller to the crank. A strong spiral spring I think the best.

The most efficient method of applying power is the next thing to be considered. No doubt the hands are best adapted to this purpose—applied to the levers in the way boatmen use their oars in pulling. Sitting in a natural position, with the feet firmly fixed against a board, the strength and muscles of the whole man, legs, loins, shoulders, and arms, are brought into play; and by thus distributing the exertion equally, "many hands make light work." The levers should both be worked precisely together, as the boatman pulls his two oars at once, and should describe as small an arc as possible. I think this would be conveniently done by connecting them by rods to a pair of horizontal knee-joint levers, in connexion with two of the propeller cranks. I cannot at present give a design of such a carriage to illustrate my suggestions, but if your correspondent, Mr. Pearson, or any of your readers wish it, I will furnish one with details.

I am, Sir, yours, &c.,

GEORGE ROBINSON.

London, 26th February, 1842.

[The plan referred to by our correspondent, in a postscript to his letter, we shall be glad to receive.—Ed. M. M.]

WALKER'S HYDRAULIC ENGINE.

Sir,—I have seen in the *Mechanics' Magazine* two accounts of a hydraulic machine patented by a Mr. Walker—the first account by Mr. Baddeley, the second by a Builder. The subscriber was at Madras in 1822, when a person, by the name of Wood, made a machine exactly corresponding with Mr. Baddeley's description and drawing. It was for the purpose of drawing water in greater quantity than in the usual way, as the ship was very leaky and heavy laden. The passengers made a subscription for the inventor. Wood was carpenter on board, and the commander, his brother. It was spoken of in high terms at Blackwall at the time, as the ship was considered to have been saved by the invention.

Your obedient servant,

SAMUEL TOZER.

12, High-street, Kensington Gravel Pits,
April 7, 1842.

WALKER'S HYDRAULIC ENGINE.

Sir,—In perusing your 971st Number, Mr. Baddeley's communication adverting to "Walker's Hydraulic Engine" came under my notice—and I now beg permission to lay before your readers a few remarks upon it.

As to there being any advantage obtainable from the peculiar construction and operation of this engine, I consider it a perfect fallacy. The plain facts are these: firstly, that in its first action it is neither more nor less than a lifting pump; and in its second a forcing pump; secondly, that these two operations are required to obtain the result of one action, of either the common forcing or lifting pump—and, finally, that it is only under particular circumstances, and in particular places that it can be applied. The valve being at the botton of the elevator, according to Mr. Baddeley's statement, (by the bye, not the right place after all,) the upward motion of the elevator must consequently have to lift the whole weight of water in that tube above the valve, and I defy Mr. B. to show that this weight of water is in any way counterbalanced (as he says) by the other elevator, while in action: now this is the lifting operation—differing in its results from the common lifting pump in this important particular only, that the lift does not discharge its water, but requires to be forced out by a second motion, namely, the downward stroke of what is termed, the elevator; the water in the well, cistern, or what not, acting, if it has sufficient depth, and consequent resistance—the motion of the elevator being quick, as the piston—and this is the force pump operation. Now, I beg to ask in what does this differ from the common forcing pump? Why, in nothing but the substitution of water (without the slightest possible benefit accruing by it,) for the well-known ram; and here is Mr. Baddeley's "legerdemain"—two well-known operations to be performed, to obtain a result which either is capable, singly, of producing.

There are other disadvantages attending this "*wonder-working*" machine, which, in all probability, hereafter, I shall be required to exhibit.

I am, Sir, your most obedient servant,

JAMES A. EMSLIE.

Newcastle-upon-Tyne, April 2, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

BENJAMIN AINGWORTH, OF BIRMINGHAM, GENT., *for improvements in the manufacture of buttons.*—Rolls Chapel Office, April 7, 1842.

Six skins of parchment about buttons! To *thread* our way through them is no easy task, even with the aid of the admirably elaborate directions for *threading* given by the patentee—as hard, almost, as finding the

needle in the bundle of hay—but nevertheless, "To all whom it concern, Know ye," that the present improvements relate, firstly, to the shanks of buttons, and secondly, to the backs and faces of buttons.

And first, of shanks—there are seven different sorts described. No. 1 is "a small round, or roundish knob of metal, perforated through the centre with two holes, intersecting, or crossing each other at the centre; the said knob being applied to, and securely fastened to the centre of the back of the button, parallel to the plane of the circular edge or circumference of the front or face of the button. In attaching a button having such a shank to a garment, the sewing-thread may be passed by its needle first through one of the holes of the shank in one direction across the shank, in order to obtain one fastening-stitch, and then through the other hole to obtain another, and so on; the needle may be passed in at one orifice, and out at the next, without going right through, and by thread being so passed, buttons may be very securely attached by sewing; the orifices are to be made bell-mouthed, in order to prevent the thread cutting. That part of the knob which is to be attached to the button is flat, and to be fastened by soldering. The button may be covered with felt, cloth, or other tissue or fabric, the overlapping circumference of the cloth being gathered over all round the turned back border edge of the front shell, so as to overlap into the hollow within that border edge, and the circumference of the concave back shell being then inserted within the same turned back border edge of the front shell, and within the turned over edge of the covering. The pressure which is next exerted on that border edge, and on that of the concave shell back by the dies in the mould, is caused to compass the said edge, so as to fasten the covering, and at the same time to consolidate the front and back shells together into a covered button, made in a mould by dies with pressure, on the plan known to the manufacturers of Birmingham as "Mr. Aston's method;" or the concave shell back may be applied to a front made of mother of pearl, stone, spar, glass, or other suitable material, or porcelain or pottery, the circumference of the concave back shell being, in the last-mentioned case, inlaid into a suitable circular recess or hollow, excavated in the back surface of such front, and fastened there by cement." No. 2 consists of a small tail, divided into two pieces by a saw, and is stated to be particularly applicable to concave shell backs. The divided tail is inserted through a hole in the centre of the button back, the two pieces are then separated, and turned down in the manner called clinching: solder or cement may be applied over the clinched branches, to make all smooth if desirable. No. 3 has a small screw-threaded tail passed through the back of the button, and secured between the back shell and the front part of the button by a small nut. (The two shanks last described are stated to be only applicable to buttons which have "backs formed of concave metal shells," whereas that first described is also applicable to solid metallic front buttons.) No. 4 is a shank which may be cut out, or stamped out, of a piece of metal in the form of a cross; the four arms are then to be "*bended*" up at right angles, and cemented to the button back, offering the same advantages as the others, that the thread need not be passed straight through the shank, but may enter at one hole, and come out at that next it, and so on. No. 5 (a very old acquaintance) is composed of a short piece of oval, or flattened wire, bent into the form of a crescent, or staple, the two ends of which can be soldered to the back of the button. No. 6 is a shank for buttons, made of hard wood, bone, ivory, or mother of pearl; it is formed out of the same piece as the button, and has four holes which are bell-mouthed, to prevent the cotton cutting. No. 7 is a flexible shank for buttons having a concave metal shell back; it is made by perforating the back with a number of holes at equal distances arranged round its centre. Cord, or other suitable material is then passed, "a knot being first made to prevent it slipping through"!—from the inner side of the back to the outside, where it is allowed to form a small loop, and then passed through a hole opposite to that from which it came out into the inside of the back, where it is again secured by a knot, or other suitable fastening, and so on, till a cord has been passed through each hole in succession.

Secondly, of the backs and faces of buttons: The first improvement described under this head, relates to buttons made of porcelain, glass, or earthenware. "The back surface is excavated with a circular recess or hollow, which may be as large as the size of the button will admit, consistently with leaving a substantial border of material all round the outer circumference of the button, for strength, and into the hollow of that circular recess the exterior circumference of a shell back is inserted, and is fastened therein by cement; that shell back may be a concave metal shell with any kind of shank." A similar back, with a flexible shank of cord similar to that before described, may be made of porcelain or earthenware, instead of metal. The next improvement relates to that kind of buttons which are termed stud buttons, or shirt buttons, of which a description is given that

is quite a curiosity in its way. Stud buttons, we are told, are "a kind of buttons which are not permanently sewed or attached to the garment; but the part of a stud button which answers to or occupies the place of a shank, is inserted into an additional button-hole in the garment, for the purpose of fastening the stud button thereto, by means of such additional button-hole, and the head or front of the stud button is inserted through the usual button-hole in the garment for effecting the intended buttoning of the garment by the stud button." The improvement in such stud buttons is the application thereto of fronts of porcelain glass or earthenware. A hollow is made in the top of a metal stud, into which is fixed by cement the porcelain, glass, or earthenware head; the outside rims of the metal are then to be turned over and pressed on to the said face, to hold it fast, or a hollow is made in the back of the porcelain, glass, or earthenware head, into which the metal part fits, the porcelain, glass, or earthenware, in such case, overlapping the metal part of the stud. Another improvement relates to what are known by the term covered buttons, with flexible shanks made in moulds by pressure, with dies, according to the Aston method, before alluded to. Such buttons are, it seems, not commonly made by that method, with their backs as well as fronts covered with cloth or silk, or other material, being covered so as to conceal all the metal that is contained in the structure of the button; but by a peculiar mode of manufacture, for which former letters patent were granted to the present patentee, Mr. Aingworth, on the 30th August, 1831, covered buttons can have their backs as well as their fronts covered; and that mode of manufacture is now carried on under assignment of the last-mentioned patent, by Messrs. Sanders and Bromsgrove. A concave metallic shell back, of the usual kind for making common flexible shank buttons, has a hole of considerable size made through its centre, so that the said back forms, in fact, a sort of metal collet, and a circular disc of cloth, silk, or other material, has a small sized hole made in its centre. The cloth is then applied concentrically on the back or convex surface of the shell back, and is slightly fastened to that surface by a cement of shell lac. The central part of the cloth, around the small central hole, is pushed through the larger hole of the metallic shell, so as to protrude through that hole into the interior concavity of the shell; and the part of the cloth which is thus caused to protrude, is stuck fast to that interior with cement of shell lac, so as to overlap a little all round the circumference of the central hole of the shell back, withinside the concavity of that shell. The front and back parts of the button are then to be put together in the usual way.

The claim is—First, to the new kind of metallic shank, No. 1, "applicable to solid metal buttons and to buttons with concave metal shell backs." Secondly and thirdly are repetitions of the words of the first head, but applied to the shanks No. 2 3, 4 and 5 Fourthly, to the new kind of shank for buttons, made of hard wood, horn, bone, ivory, or mother of pearl, which shank is formed in the same piece of material. Fifthly, the new kind of flexible shanks of cord for metal shell backs, which backs are covered with cloth or silk. Sixthly, the new kind of porcelain, glass, or earthenware fronts, for buttons. Seventhly, "the application of fronts of porcelain or earthenware to studs." (*Glass*, though noticed in the description, is not claimed.) And, eighthly, "the application of a covering of cloth, or other material, over the convex surface of the metal shell backs of covered buttons."

William Hirst and Joseph Weight, of Leeds, Clothiers, *for certain improvements in the machinery for manufacturing woollen cloth, and cloth made from wool and other materials.* Enrolment Office, April 7, 1842.

These improvements are stated to consist "in a certain *method* of manufacturing woollen cloth and cloth made from wool and other materials, by a *new process*," of which new process the peculiar feature or result is the addition to cloth already woven, either on one or both sides, or the interposition between two pieces of woven cloth, of a layer or layers of wool (felted merely). Then follows a description of certain machinery by which bats of wool may be felted. The bats are passed between what are called "Platous," (so spelt and so marked by inverted commas in the specification,) and much is said of these "Platons," how they are to be moved in opposite directions, with a "shoggle" between whiles, and how the bats are to be conveyed to and from them, &c., &c. (No doubt *platens* are meant—things common enough, one would have thought, to preclude the possibility of such orthographic and apostrophic blundering.) But how the layers of wool, when so felted, are to be combined with the woven cloth, the patentees do not explain. The machinery described is simply machinery for felting. Neither do the patentees specify, as they were bound to do, in what respects their machinery differs from that in common use; what parts are old and what "improvements." The claim is to, 1. The ma-

chinery described; and 2. To the addition to woven cloth of layers of wool on one or both sides, or between, &c.

Mathias Nicholas La Roche Barré, of Saint Martin's Lane, Middlesex, Manufacturer of Cotton, *for an improvement in the manufacture of a fabric applicable to sails and other purposes.* Enrolment Office, April 7, 1842.

The improvement which is the subject of this patent, consists in forming each warp thread of two or more yarns of cotton, (Nos. 3 to 30 are the sizes of yarn preferred, the thickness and strength, as well as the cost, increasing with the size of the yarn,) twisted together, and each shoot of the weft of four or more yarns of cotton. To make sail cloth, No. 3 yarn is used, and both the warp and weft threads are of two yarns twisted together; for, in this case, it is considered important that both the weft and web should be of the same size and strength. The warp may be worked into any pattern that may be desired. The patentee prefers producing the fabric by raising and lowering equal quantities of the warp thread at each time of forming a shed for the passage of the shuttle, and usually makes the fabric by causing each shoot of the weft to float alternately under and over two warp threads. He is thus, he says, enabled to produce a strong and lasting fabric of cotton, suitable for the making of sails, rick cloths, and such like articles, capable of sustaining the different degrees of heat and moisture to which they are likely to be exposed. If greater strength and thickness are required, a larger number of yarns twisted together, with the same number of warp threads to each inch of the warp, will answer the purpose; if greater strength, without increasing the thickness, more than two yarns twisted together of a larger size of yarn than No. 3, are used. By varying the number of yarns used, and the number of yarns combined in each warp thread, the thickness and strength may be varied as required.

The claim is "the mode of manufacturing a fabric of cotton suitable for sails and other purposes, by applying warp threads, each composed of two or more yarns of cotton twisted together, when combined with the use of weft composed of four or more yarns for each shoot."

Alphonse René Le Mire de Normandy, of Redcross-square, Cripplegate, Doctor of Medicine, *for certain improvements in the manufacture of soap.* Enrolment Office, March, 1842.

This invention is stated by our contemporary of the *London Journal* to consist in introducing into soap, manufactured in the usual way, the salts of potash or soda, generally, but more particularly the sulphate and carbonates of potash and soda. These substances are introduced into the soap (when the saponifying process is complete, and it is ready to be cleansed) either in the solid state, in pulverized masses, in the state of crystals, or in the state of crystals melted in their water of crystallization, or else dissolved in steam or water. The quantities of the salts of potash or soda used to every eighty pounds of soap, are 28lbs. of sulphate of soda, and 4 lbs. of carbonate of soda or potash, or 2lbs. of each of these last substances; if the substances are used singly, then the quantities are 32 lbs. of sulphate of soda, or 15 lbs. of sulphate or carbonate of potash, or 10 lbs. of carbonate of soda. When the process of saponification is complete, and the soap in a hot and liquid state, is turned over into the cleansing copper, the salts, in the proportions above mentioned, are thrown into it, and the whole thoroughly mixed together; the soap is then removed from the copper and poured into the frames to cool. If the salts are used in a liquid state, they are dissolved in their own water of crystallization, or in steam, or by boiling water, and are the then mixed with the soap, as before mentioned. The patentee claims the introducing into soap, already manufactured, or in process of manufacture, the salts and compounds of potash and soda before mentioned.

COUPLAND'S IMPROVMENT IN FURNACES.

Sir,—I beg to state that Mr. Coupland's principal claim for his improvements in furnaces, consists in the admission of atmospheric air through the grate bars, or perforated plate, after the fuel has been placed upon them, and not to the mere depression and elevation of the grate-bars, as stated in the *Mechanics' Magazine* of the 9th instant, and that the auxiliary apparatus in its present improved state is simple in its construction, and efficient in its operation.

I am, Sir, your most obedient servant,

J. Rhodes.

Pond Yard, New Park-street, Borough,
April 13, 1842.

[The abstract we gave was quite correct; the bars *are* lowered, solely and exclusively "to enable a fresh supply of fuel to be placed thereon" as wanted. "*Without interfering*," it is true, "with the draught necessary for the combustion of the fuel;" but not interfering with, and actually contributing to, the supply of air, are two different things. To prevent any further cavil on the subject, we subjoin the *ipsissima verba* of Mr. Coupland's claim. "What

I claim is, the lowering at pleasure, and in a horizontal position by any suitable apparatus, (though I prefer that hereinbefore described,) a portion of the open fire-bars of a furnace to a position sufficiently below the fire, *to enable a fresh supply of fuel to be placed thereon*, and then raising them again to their former position in the furnace, and retaining them there till the fuel is consumed, and a fresh supply required, without interfering with the draught necessary for the combustion of the said fuel while being so consumed, as aforesaid, and thereby I am enabled to do away with all feeders, hoppers, pushers, plunges, pistons, and inclined planes, and other the like objectionable apparatus, which have hitherto impeded the successful application of inventions for feeding furnaces from below upwards."—Ed. M. M.]

NOTES AND NOTICES.

Mr. Williams's Argand Furnace.—At the monthly meeting of the Commissioners of the Birmingham Street Act, held on Monday last, the committee appointed to consider the best means of effecting an abatement of the smoke nuisance, reported that they had inspected the steam chimney of Mr. Clifford's mill, in Fazeley-street, to which the patent of Mr. Williams, of Liverpool, had been applied with the view of consuming the smoke from the furnace, and they were perfectly satisfied of the utility of the plan, and its efficacy in accomplishing all that was required. The committee also referred to two letters which they had received, in reference to Mr. Williams's invention, from Messrs. Sharp, Roberts, and Co., of Manchester, and Mr. Nicholas Knight, of Liverpool, which stated that the plan had been adopted with the most complete success, diminishing the consumption of coal, increasing the quantity of steam, and, at the same time, reducing the amount of manual labour. *Midland Counties Herald.*

Atmospheric Pressure-Engine.—The *Toulonnais* has the following:—"M. Lewinsky, a Pole by birth, but naturalised in France, will in a few days make trial of an atmospheric pressure-engine, in a small boat which Admiral Baudin has placed at his command. We have before us a certificate by Captain Durbac, of the port of Marseilles, affirming that M. Lewinsky in the course of last year made a trial of his engine, which is of wood, in a flat-bottomed boat, which he was thereby enabled to take out of the port of Marseilles, and reach the fourth buoy, at the rate of between three and four knots an hour, although the sea was very boisterous. He had previously made an experiment at Rome, in the presence of numerous spectators; this attracted the notice of the English consular agents, and induced them to communicate an account of it to their government. The Lords of the Admiralty in consequence wrote to M. Lewinsky, inviting him to bring his Invention to England, promising him every protection and encouragement; but M. Lewinsky, wishing to present his discovery to his adopted country, declined accepting the flattering offer."—Fudge!

A total Eclipse of the Sun takes place on the 7th of July next, during which the moon's shadow will pass over Spain, the South of France, the north of Italy and part of Germany. To assist parties desirous of observing this remarkable phenomenon, the Astronomical Society have compiled a Table, (copies of which may be had on application at the Society's Rooms,) by which the path of the moon's shadow may be traced with very considerable accuracy.

Steam Navigation on the Volga.—Although an isolated steam-boat was licensed to navigate the Volga in 1817, no spirit of enterprise was roused until the year 1827. The line between Nishegorod and Astrachan now employs nine steamers, whose engines vary from 69 to 97 horses power. They not only convey passengers and goods, but act as tug boats, and draw after them a barge containing wood as fuel for the machines. The length of the voyage from Nishegorod to Astrachan is between twelve and fourteen days, including their stay at Casan and Saratof; but they are from twenty-five to twenty-eight days on the return voyage, the current of the stream, and violent winds impeding their progress. The passage money is from 80 to 120 roubles (£6 13s. to £5 10s.) for the voyage to Astrachan, but about 50 per cent. dearer for that from Astrachan to Nishegorod, and the passengers feed themselves. During the last two years, a new description of passage vessel, worked by machines driven by horses, has been introduced. The steam-boats are private property, and all of them are manufactured by engineering establishments in the province of Vladimir. The cost is from 45,000 to 75,000 roubles, or from £2,065 to £3,430. The iron boats, which are coming into use, cost from 100,000, to 120,000 roubles, or from £4,585, to £5,500; they are dearer, it is true, but are much more durable than vessels of timber, more flat-bottomed, and draw less water.—*United Service Journal.*

Magnetic Binnacle.—We understand that Mr. Payne, optician, South Castle-street, after a series of experiments, which, altogether, have occupied eighteen months, has succeeded in producing a binnacle so loaded with magnetism as to counteract the local attraction of the compass in iron vessels. It is pretty generally known that hitherto the mariner's compass has been useless in iron-built vessels, unless they have undergone a process, invented by Professor Airey, to "compensate" their magnetism. This compensation, for which the vessel under process is to be continually turned and moored, unmoored and turned again, is very tedious, and, consequently, expensive. It consists in placing large magnets at such a distance from the binnacle, or other compass, that their attraction is equal to the deviation occasioned by the magnetic influence of the vessel. Mr. Payne's plan allows the whole arrangement to be executed in the workshop, and the invention comprises an entirely new method for the circulation of the magnetic fluid. The exact process is to be kept a secret until a patent be secured; but from the explanation the inventor volunteers, it appears that he collects and fixes a vast quantity of magnetism in his binnacle, and causes its influence to ascend in a conical direction towards the centre of the compass needle. The magnetism of the iron vessel is attracted to this magnetic arrangement, which cuts off a direct communication between the needle and the vessel, and leaves the needle as free to act correctly on board the vessel as on shore. The magnetic binnacle swings on substantial gimbals within an outer binnacle, covered with the usual brass top, lamp, &c. The saving of expense by this new plan will be considerable, and it will not be liable to an objection, which is advanced against Professor Airey's plan, that the compensation is not lasting. It has been found that a variation in compasses, compensated on the Professor's plan, arises by the iron of the vessel losing some of its magnetic strength by gradual oxydation, paint, &c.; while the large compensating magnets remain in preservation, and, after having been exactly powerful enough, become too powerful. The compensating power of the "magnetic binnacle," on the contrary, cannot be too powerful, but may be not sufficiently so, a defect which is soon seen, and can, of course, be easily remedied. The first binnacle constructed on this plan is now on board the *Mersey*, iron steamer, plying between Birkenhead and George's Pier,

and occasionally employed as a tug-boat at the entrance of the river.—*Liverpool Albion.*

Blasting by Galvanism.—Mr. Hobert's mode of blasting was for the first time in the neighbourhood of Glasgow carried into practical operation in Mr. M'Callum's quarry, adjoining the Necropolis, on the evening of Saturday last. The operations were directed by Mr. Wilson, of the Mechanics' Institution, and the successful result in every instance gave a most convincing proof of the practicability of the application. Some hundred tons of rock were detached; and several practical men who were present, and who previously were sceptical on the matter, expressed their complete conviction that the adoption of this mode of discharge would be more efficient and economical than the common one.—*Caledonian Mercury.*

Iron Steam Frigates.—Yesterday afternoon, a steam frigate, 800 tons burden, was launched from the iron ship-building yard of Mr. J. Laird, North Birkenhead. This is the only large vessel of war which has been built at this port since 1809, when the *Havannah* frigate was built. She will carry 68-pounders pivot-guns, and will be fitted up in all respects like Her Majesty's steam frigates. Her machinery and armament will be completed without delay. The East Indies is said to be her destination. She will make the eighth iron vessel of war which Mr. Laird has built; they all carry pivot-guns fore and aft. Four of them are now in the Chinese seas, namely, the *Nemesis* and the *Phlegethon*, carrying two 32-pounders, and the *Adriane* and the *Medusa*, two 24-pounders. The other three are in the Persian Gulph.—*Liverpool Paper.*

Dollond's New Barometer.—At the last meeting of the Council of the Royal Agricultural Society of England, Mr. George Dollond, of St. Paul's Churchyard, submitted to the inspection of the council an improved barometer for ascertaining the changes of atmospheric pressure. The improvement effected by Mr. Dollond in this important meteorological instrument, not only obviates many of the common difficulties incidental to mountain-barometers, and when out of use and packed up, becomes as firm and secure as a walking-stick, but it embraces in its construction many of the advantages of the stationary barometer or weather-glass, as an indicator of changes taking place in the weight of the atmosphere. This improvement is chiefly attained by a most ingenious contrivance in the arrangement of the mercurial cistern, and the application, for the first time, of an air-tight stop-cock, for regulating the passage of the mercury into the cistern, or enclosing it securely within the tube. Mr. Dollond states the following as the principal advantages resulting from this arrangement:—1. A true and certain state of altitude in the column of the mercury from the highest to the lowest situation on the globe, without the necessity of applying the uncertain and tedious corrections required in ordinary barometers. 2. The uniformity of the observations, arising from the free and unobstructed condition of the mercury; all the advantages of the open cistern barometer being thus attained without the attendant difficulty of arranging the starting point of measure. 3. The entire exclusion of air from the inner tube or cistern, and the consequent preservation of the surface of the mercury from oxidation. 4. The application of this new arrangement is capable of application to barometers of any diameter, and with exclusive advantages obtained by no other mode. 5. The perfect security in carriage, when the barometer is either out of use, or required to be conveyed from place to place. The council ordered their best thanks to Mr. Dollond for the favour of this inspection.

Steam Ploughing.—The Highland and Agricultural Society of Scotland have again offered a premium of 500*l.* for the first successful application of steam to the cultivation of the soil. No premium was awarded last year, and the committee announce their intention of withdrawing the notice after the present year. The particulars with reference to the premium may perhaps be interesting to some of our readers, and we therefore subjoin them:—"A premium of five hundred sovereigns, or such other sum as the directors may see proper in the circumstances, will be awarded for the first successful application of steam power to the cultivation of the soil. By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used, and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving in *time*, *labour*, and *outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil."

Liverpool Mechanics' Institution.—This institution appears to be by far the most extensive and prosperous establishment of the kind in the kingdom, and is effecting an immensity of good in the large and important community in which its operations are carried on. The buildings devoted to the purposes of the institution cost 15,000*l.*; it contains upwards of 3,300 members, with 850 pupils in three day schools, and 600 pupils in fifteen or sixteen evening classes. There are fifty teachers regularly employed, whose salaries amount to 5,000*l.* a year; a library of 9,000 volumes with 1,600 readers, and a daily distribution of 200 books. The public lectures are delivered twice a-week, and are attended by audiences varying from 600 to 1,300. The total receipts for carrying on this extensive machinery, amounted last year to 6,939*l.* 18*s.* 6*d.* The evening schools afford instruction in English, writing, arithmetic, mathematics, mechanical philosophy, navigation, astronomy, botany, naval architecture, mechanical, landscape, architectural, and ornamental drawing and painting, together with modelling and practical perspective. At the last exhibition of the Liverpool Academy, there were eight paintings by teachers in the institution, and twenty one by artists who were formerly pupils within its walls. There are also day schools in connexion with the institution, in which a comprehensive system of education is carried on, adapted to the age, capacities, and pursuits of the pupils. The extra classes comprise instruction in chemistry, natural philosophy, the French and German languages, classics, vocal music, &c.—*Midland Counties Herald.* [The Liverpool is what the London Institution—the elder of the two—might have been and would have been, had the views of the founders not been most unfortunately thwarted.]

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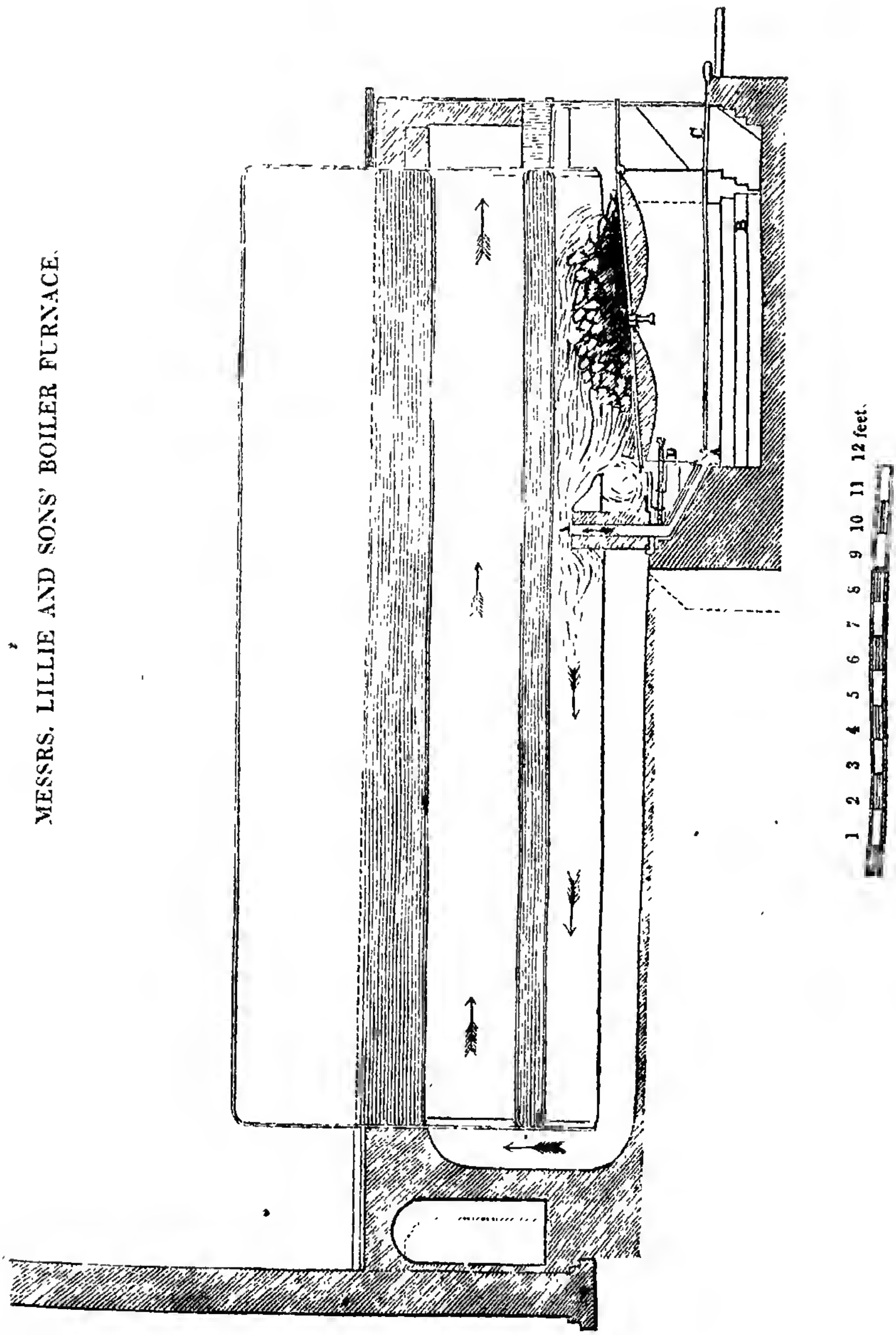


MESSRS. LILLIE AND SONS' BOILER FURNACE.

MESSRS. LILLIE AND SONS' BOILER FURNACE.

Sir,—Without desiring to impugn the general correctness of your censure of the late Leed's Smoke Report, I must, nevertheless, make a claim on your candour for the allowance of one (at least) remarkable exception to it. The parties who laid plans before that meeting were not *all* "smoke doctors;" neither were they all patentees, outbidding one another for the favour of the public. Some there were who simply communicated the results of their own private and personal experience, without hope of fee or reward—who sought to make no traffic of their knowledge or skill, but to make it freely available for the benefit of the public at large. First in this class (according to Mr. West's order of enumeration,) were Messrs. Lillie and Son of this town, and it is in behalf of the plan submitted by them that I beg to enter the present appeal. It appears to me to be an eminently simple and efficacious plan—combining the nearly complete prevention (I suppose we must no longer say *combustion,*) of smoke with great economy of fuel; but it was "never before published," and but for this Leeds meeting might never have been published at all. So far, therefore, you must allow the meeting did good.

The plan, as will be seen from the accompanying engraving, which exhibits a longitudinal section of a forty horse boiler and furnace, erected at Messrs. Lillie and Son's works in Store-street, (a similar one may be also seen at Horrocks and Co.'s, Preston,) consists merely in a regulated admission of air into the furnace through the passage A, at the end of the ash-pit B, (immediately before the bridge). A rod C is connected to a valve by which the air passage is opened and closed. The air is allowed to flow in for four hours after first firing in the morning. This is stated to have the effect of completely consuming the smoke during this period, when it would otherwise be given off most abundantly. By this time the coal is coked, and the valve is shut for the remainder of the day; the air which passes through the bars being then sufficient for the combustion of the carbonized fuel. They supply the furnace with fuel only at starting in the morning, when they put on sufficient to work the engine throughout the day. They make no clinkers, and only a very small proportion of ashes, which are let out by the slide D. The whole of the front of the firing end of the boiler is made perfectly air-tight, there being folding doors under the dead plate, in which are two smaller doors, which are opened and shut at intervals, as the steam-gauge requires. These doors regulate the steam, by admitting more or less air.

The boiler, set on this plan, has been at work about ten months, to the entire satisfaction of Messrs. Lillie and Son in every respect. In a former furnace which they had with Stanley's feeder, the consumption of coal was 20 lbs. per hour per horse power; they now have a more regular supply of steam, from 13 lbs. of coal per hour for each horse power, so that the saving of fuel is, in this instance, 35 per cent. They estimate it at 20 per cent. on the average. The cost of erection of the furnace itself is pretty nearly the same as on the old principle; but the inventors are of opinion that there is no necessity, where their method is employed, for the expense of erecting the very high chimneys at present generally in use. Their chimney, which is 30 yards high, they consider sufficient for 500 horse power.

Relying on your willing co-operation to make this very useful plan as extensively known to the public as it is freely presented to them,

I remain, Sir, your constant reader,

H. H.

Manchester, April 7, 1842.

ON THE MANAGEMENT OF FURNACES AND BOILERS—BY C. W. WILLIAMS, ESQ.

[In continuation from p. 294.]

Sir,—Having in my last pointed out the connexion between the quantity of combustible gases generated in a furnace, and the length of flame produced by their combustion from the proper admission of air to those gases behind the bridge, I now propose considering the actual condition of the flues, the character of the products of combustion which they contain, and the temperature of those products. The main object in this examination, as regards practical information and improvement, is, the ascertaining, first, whether we

obtain, from any given weight of fuel, all the heat which it is capable of giving out? And secondly, whether the entire, or what portion of the heat so obtained, is turned to evaporative or other purposes; in other words, how much of the available heat is usefully applied, and how much is lost? These are the cardinal points in the inquiry; yet on these we obtain but little information from books. Until, however, these questions shall be satisfactorily answered, it is manifestly idle to draw conclusions as to the efficiency of a furnace or boiler, or the evaporative power of any description of fuel, from the consideration alone of the water evaporated.

Much has been written on the subject of the areas, surfaces, and mechanical proportions of furnaces and boilers; and they have been condemned or approved, not from their relation to the degree of perfection in which combustion is effected, or the quantity of heat generated, taken up, or wasted, but by reference solely to what is but a secondary result, namely, the quantity of water evaporated. It is true, the increasing this quantity is the great practical end in view; but we are now speaking of the mode of estimating that quantity in reference to the fuel employed: my object, therefore, is to show that until we have ascertained the quantity of heat wasted or misapplied, we are not in a position to draw any inference from that portion which may be usefully employed. Were we convinced, that all our arrangements and processes are so complete that the coal is enabled to give out all its heat, and the water to absorb it all, the amount of evaporation might then be taken as a correct exponent of the areas, surfaces, and proportions of air furnaces and boilers, and the merits or demerits of any system of combustion. Arbitrarily, however, referring certain effects to certain proportions, we assume the very objects of the inquiry, and the very data on which the whole depends, and thus commit the practical error of laying down rules and giving formulæ for calculations (as Tredgold and others have done) which must necessarily be as speculative and uncertain, as the assumed data on which they are based.

That these two divisions of the subject are not only distinct, but even frequently opposed to each other in practice, may be proved by showing that the amount of evaporation may continue the same, under processes in which the quantities of heat generated may be essentially different; or, that the same quantity of heat under one arrangement may produce a much larger evaporative effect than under another. The weight of water evaporated, or in other words, the quantity of water taken up by the water, so far, indeed, from being a certain or adequate criterion of efficiency in a furnace or boiler, is in truth but one only of those incidents from which our calculations and inferences are to be drawn, and is not entitled to credit when taken apart from those others which have equal claim to consideration. This lumping sort of process however—this estimating the effects of many combining, or even adverse causes, from a single result—has much retarded our progress towards obtaining that correct estimate of details from which alone a safe conclusion may be drawn. Until we are enabled to distinguish and appreciate the several varying results, giving to each its due measure of cause and effect, we are but floundering in the dark, and on a wrong road, without any chance of arriving at the wished-for end.

With respect to the first point—whether we obtain the full measure of heat from the fuel employed, this is a purely chemical question: as, however, the heat developed will be in the ratio of the perfection of the process of combustion, the visible inspection which I suggest will go far to enable us to form a very accurate estimate on this head.

If the flame passing from the furnace exhibit a uniform state of activity, and a clear white colour, we may be assured that the combustion of the coal gas is complete; the atmosphere in the flues will then be transparent, and the fuel may be considered as giving out its full measure of heat.

On the charge of coal being thrown on, the evolved gases should, at once, become ignited, if the air be properly administered. The interior of the flues will then exhibit an increasing flame (as shown in my last communication) until it is from 20 to 30 feet in length, instead of Tredgold's standard of 6 feet. Mr. Dewrance, engineer of the Liverpool and Manchester rail-road, states, respecting a boiler furnace to which the air is properly admitted, and which is 3 feet square—"We have a clear flame along the flues to the distance of 30 feet from the

fire, and the flues at this distance are quite hot: previously, this part was quite cold."

On the charge being about half exhausted, and when the mass on the bars begins to assume a red glowing appearance, a visible change frequently comes over the whole, which is here worthy of notice, as I have not seen it alluded to by others. This change is caused by the manner in which the charge of coal burns in the furnace. If equally and uniformly, the clear internal atmosphere will continue undisturbed—no smoke will be produced, and the combustion of the gaseous matter will remain perfect to the end. If, however, the coal burn partially, or into holes, leaving parts of the bars uncovered, the flame will then be altered, and from its previous white and flaky character, it will assume a reddish cloudy appearance—the atmosphere in the flues will no longer be transparent, but will become hazy or dark—smoke will be generated—the eliminated carbon will be deposited along the flues and boiler plates, and, by its non-conducting character, seriously influence the evaporative effect. The deposition of carbon will instantly be detected by its coating the bulb of the thermometer.

Now this derangement of the process of combustion cannot be detected, or even supposed to exist, except by internal inspection, and by the aid of sight-holes and thermometers; for on looking in at the door, the furnace and its contents exhibit an active glowing state—the change I have described, and the production of smoke, only showing itself when the door is shut. The interior appearance, however, of the flues, and the fall of the thermometer, (which we know must be accompanied by a diminished evaporative effect,) at once sets us right, and contradicts the deceptive appearances in the furnace—proving, incontestably, that we are not then obtaining the entire heat which the fuel is capable of giving out.

If allowed to continue, the evil consequences rapidly increase. The fuel burns away still more irregularly, and a considerable loss of heating effect will follow, quite sufficient to derange all calculations or results, although no indication of the kind will be discovered by looking in at the doors.

These injurious effects are occasioned solely by the partial admission of the air through the little craters or holes in the burning mass, and the uncovered bars, in larger quantities than is consistent with the conditions under which the gaseous matter enters into combustion, or these can be chemically disposed of at the moment of its admission. Such unequal quantities of air, though entering in at the hottest part of the furnace, not only carry away much heat, but, by cooling, the evolved gases below the temperature of chemical union and action, convert them into true smoke.

The disease being discovered, the remedy at once suggests itself, and is as simple as it is scientific—namely, fill up those holes or cavities in the burning mass with fresh coal, or equalize it on the bars, and thus prevent the partial admission of the air. Either expedient will at once restore the previous clear white flame and transparent atmosphere in the flues, and again raise their temperature. Here we have a further proof of the value of these sight-holes and means of internal inspection; for not only have they indicated the nature and cause of the derangement, but the effectiveness of the remedy. Without this visible proof, indeed, who would have supposed that the throwing a little fresh coals into these holes in the burning mass, would have had the effect of stopping the generation of smoke—checking the fall of the thermometer and raising the temperature of the flues? An observant fireman will soon appreciate and correct these changes: but there can be no law or regulation for preventing such evils, since the irregularity with which the fuel burns will depend on many casual circumstances, as, the peculiar burning quality of the coal—the unequal size of the lumps—a mixture of different sizes and kinds—the irregular formation of clinkers, or careless charging. Attention to these matters will give no trouble, if the means of interior inspection be supplied: but without it, the master, as well as the fireman, will be perplexed by results for which they cannot account—finding the chimney smoking, and the evaporation diminishing at the very moment when they least expected it. Under such circumstances, the evil will be attributed to any thing but the right cause: for as well may we pretend to describe what is taking place in a room from which we

exclude all light, as to discover what is taking place in the furnace or flues, without the means of looking in.

We have now to consider the second, and equally important point—whether the entire of the heat supplied by the furnace is usefully applied by the boiler? For, even supposing we aro satisfied on the first head, and that combustion is absolutely perfect, we are still as far as ever from being in a position to determine the efficiency of boiler, furnace, or fuel, until the amount of escaping, or lost heat, be correctly ascertained, an amount which I have frequently found to be as much as one-third of the entire heat, which might be obtained from the fuel. Under such circumstances of palpable loss, it would be as irrational and deceptive, to measure the evaporative effect of any coal or boiler, without taking into account the quantity of waste heat, as it would be to measure a liquid without noticing the loss by leakage or overflowing of the vessel employed. We have therefore to ascertain the absolute temperature of the escaping products, and the rapidity of their current; yet these are matters which are most neglected in ordinary practice. On the practical bearing of this part of the question, being the proportion of the heat applied or lost, the following table, indicating the temperature of the escaping gaseous matter, will supply us with some useful facts:—

Time.	Thermometric temperature.	Length of flame in feet.
Charge	466	10
2 minutes	462	14
4	490	18
6	508	22
8	518	26
10	524	26
12	528	28
14	534	28
16	540	28
18	540	28
20	540	26
22	536	24
24	524	24
26	508	22
28	494	22
30	486	20
32	476	18
34	468	14
36	464	14
38	460	12
40	460	10
Charge	460	10

We have here the relative temperatures of the escaping products after having made the circuit of a cylindrical boiler, (see *Mech. Mag.* No. 971,) 15 feet long, taken at a distance of 48 feet from the furnace. The thermometer had its bulb inclosed in a protecting tin tube, and inserted through an iron plate which covered the flue. The tube was introduced only so far as kept the temperature below 600°—the entire range, as we see in the table, being between 460° and 540° or but 80 degrees.

So far as the rate of progression, in two minute time, during a charge which lasted forty minutes is important, the result may be depended on: the absolute temperature of the gaseous escaping current was, however, considerably beyond what could be indicated by the thermometer, and was ascertained to be from 200° to 250° beyond what is stated in the preceding table. This fact was determined beyond all question, by means of the melting points of a series of metallic alloys prepared by Dr. Kane, after an extensive series of experiments specially undertaken for the purpose. By these metallic alloys, inserted into the flue, it was found that the escaping stream of heat was at least 750°.

Under such circumstances, could there be a doubt that a body of heat was absolutely lost, quite sufficient to defeat any calculation? And would it not therefore have been deceptive to the last degree, to draw any inferences from the mere weight of water evaporated? One thing was certain, namely, that the fuel employed gave out its full measure of heat in other words, its combustion was complete. Another thing was also equally certain, that we had not the means of absorbing and usefully applying that heat. The question then remains, What quantity of heat was lost? What was its evaporative value? And how can it be turned to evaporative purposes? These shall be considered in a future communication.

I am, Sir, yours, &c.

C. W. Williams.

Liverpool, April, 17. 1842.

THE DISC ENGINE.

Report of Josiah Parkes, Esq., C. E., on the comparative trials of a Disc and Reciprocating Engine.

Having been requested to conduct a series of comparative trials with a Disc and Reciprocating Steam Engine, I submit the following statement of the results obtained.

These trials were made at the works of Messrs. Nasmyths, Gaskell, and Co., Patricroft, near Manchester. They were conducted in the presence of a member of their firm, of their superintendent, Mr. Wilson, and of two of the patentees of the Disc Engine.

The object proposed being to ascertain, with the utmost possible accuracy, the relative quantities of water as steam, and, consequently, of fuel, which would be required to enable each engine to perform the same amount of work, it was a matter of the first importance to determine upon some work which would oppose an uniform resistance. after much consideration, I selected that which is presented by fans revolving at high velocities; considering that these machines, when driven at an uniform rate of motion, would offer a resistance so nearly invariable as to satisfy this primary condition. The Christmas holidays fortunately admitted of fans being appropriated entirely for this purpose, so that no extraneous circumstance interfered to change the nature, or amount, of the work during the trials.

The Reciprocating Engine was made by Messrs. Nasmyths, Gaskell, and Co. It is a beam engine, thoroughly well constructed, in excellent condition, and in every respect unexceptionable as a specimen of its class. I found the diameter of the cylinder to be $14\frac{1}{8}$ inches; the length of stroke 2 feet, $2\frac{3}{4}$ inches; and the number of double strokes of the piston, during the trial, averaged $41\frac{6}{10}$ per minute.

The Disc Engine (called 16 horses' power) I found to have a steam chamber of 27 inches in diameter, and the mean number of revolutions effected, during its trial, was $118\frac{1}{4}$ per minute. With these proportions, and at these respective speeds, the volume of steam which should pass through each of the two engines in a given time, as defined by the transit of the parts on which the steam acts, is very nearly the same; an equality which must be considered as tending to satisfy doubts as to the results of the trials having been affected by any other circumstances than those strictly arising out of the principles on which the two engines are constructed.

Both engines were alternately supplied with steam from the same boiler. This I found to be very deficient in the extent of surface exposed to heat, and the setting was ill arranged; consequently, the proportion of water evaporated for the coal consumed was low; but, as I adopted on this, as on former occasions, the mode which is considered to afford the only accurate means of ascertaining the expenditure of steam for a given effect, viz., that of determining the consumption of water as steam, the results obtained are free from all question which might otherwise arise as to the capability of the boiler, or the quality of fuel made use of.

The two engines, being thus supplied with steam under identical circumstances, were employed, on alternate days, to drive the same fans at similar velocities.

It was found, by previous trials, that with the quantity of steam the boiler would conveniently produce, the Disc afforded a greater amount of power than the Reciprocating Engine; therefore the number of fans driven, their velocity, and the discharge of air, were so adjusted as to provide for the resistance being within the capability of the latter engine; and thus I was enabled to keep the fans revolving at a very uniform velocity throughout both trials. This velocity was accurately indicated by a counting apparatus connected with an intermediate shaft between the engine shaft and the fans.

The two engines were of the non-condensing class, and discharged their steam into the atmosphere.

For the registration of the water a vessel was provided, which was found to contain 338 lbs. by weight; and it was arranged for the whole of the water used during the trials to be measured by means of this vessel; and the boiler being furnished with a glass gauge, I endeavoured to have the same pressure of steam, and the same quantity of water in the boiler, at the conclusion, as at the commencement of each experiment. In this I succeeded within a variation of $\frac{1}{2}$ an inch in the level of the water, for which due allowance was made.

The weight of coal burnt during each trial was also accurately ascertained; the fire at the conclusion being, as nearly as possible, in the same state as at the commencement.

Having thus taken the precautions I considered requisite to obtain results worthy of confidence, and having made some preparatory trials with each engine, the fans were connected with the Reciprocating Engine and they were driven without intermission for six hours. During this time the quantity of water as steam which passed through the engine was 10,406 lbs., equal $1734\frac{1}{3}$ lbs. per hour; and the coal consumed was 20 cwt., equal $373\frac{1}{3}$ lbs. per hour; the evaporation being in the low ratio of $4\frac{2}{3}$ lbs. of water for 1 lb. of coal. The counter actuated by the intermediate shaft registered during this trial 14,301, the greatest difference in the velocity of the fans during any hour being about 6 per cent., and the mean speed of the engine, 41·6 strokes per minute.

On the following day the fans were connected with the Disc Engine and driven for 5 hours and 57 minutes, when the counter, connected as before, had registered 14,318,

being 17 more than on the previous day; the greatest difference in the velocity of the fans during any hour being little more than 1 per cent. The quantity of water as steam required to supply the engine was 8,697 lbs., equal $1449\frac{1}{2}$ lbs. per hour; and the coal consumed was 16 cwt., equal $298\frac{2}{3}$ lbs. per hour; the evaporative ratio being about $4\frac{7}{8}$ lbs. of water for 1 lb. of coal. The mean number of revolutions of the engine shaft per minute was $118\frac{1}{2}$.

Immediately after the conclusion of this trial, the fans were again connected with the Reciprocating Engine, and the same velocity being given to them, an indicator diagram was taken off which, by comparison with the diagrams of the preceding day's trial, showed that the resistance overcome by the Disc Engine, was somewhat greater than by the Reciprocating Engine, but the difference was very small.

In order to ascertain the amount of effective power exerted by the Disc Engine, I availed myself of Mr. Davies' Dynamometer. The principle of this very complete instrument is, that the force of the resistance taken on the periphery of a driving drum or toothed wheel on the engine shaft, is denoted on the dial-plate of a spring balance, so placed that its index may be easily observed whilst the engine is at work. The engine being stopped, standard weights are suspended from the drum or wheel until the index of the spring balance marks the same degree at which it stood on the dial-plate during the action of the engine; and the velocity and circumference of the drum or wheel in feet being also known, true data are obtained for determining the work performed. By means of this apparatus—which I consider to be worthy of the utmost confidence—I found the mean resistance, or load, actually overcome, to be equal to 17 horses' power. Although this instrument was applied only to the Disc Engine, yet as it defined the resistance overcome by each, it indicated with equal truth, the effective power exerted by the Reciprocating Engine. The Dynamometric observations were further corroborated by the diagrams obtained on applying the ordinary indicator to the Reciprocating Engine, when driven without a load and when performing the same work. The indicator was verified by comparing the pressures marked by this instrument with those of a mercurial gauge acted upon by steam at various densities. The quantity of water as steam required by the Reciprocating Engine being $1734\frac{1}{2}$ lbs. per hour, and the effective power exerted equal to 17 horses, the water consumed is in the ratio of 102 lbs. for each horse power, per hour; and the water required by the Disc Engine being $1449\frac{1}{2}$ lbs. per hour, this is in the ratio of $85\frac{1}{4}$ lbs. per horse power per hour. Thus, the consumption of steam, and consequently of fuel, for equal effect, by the Reciprocating, is upwards of 19 per cent. greater than by the Disc Engine.

The mean pressure of steam in the cylinder of the Reciprocating Engine, as exhibited by the indicator diagrams, was equal to $25\frac{1}{4}$ lbs. per square inch, and the mean pressure in the chamber of the Disc Engine, as exhibited by a mercurial gauge constantly connected with it, was $23\frac{1}{4}$ lbs. per square inch.

The above effects were obtained by the two Engines when working unexpansively and with steam at comparatively low pressures. As regards non-condensing Reciprocating Engines, I have not previously met with any (and I have conducted experiments, similar to the foregoing, on many engines of this class) which has required less than 120 lbs. of water as steam per horse power per hour, even when using steam at high pressure, a fact which establishes the excellence of the Reciprocating Engine subjected to trial, as it only consumed 102 lbs. per horse power per hour.

The results of these trials are thus exhibited in terms of the quantity of water as steam actually expended in overcoming the same resistance by the two engines, and, also, according to the conventional phrase of *horse power*; but that quantity was greater in both cases than would have been required, had the steam pipes and cylinders been coated. Though, however, these were uncovered and a considerable quantity of steam must have been condensed, which had no share in producing the effect, the relative results are unaffected by this circumstance, as I found, that a nearly equal extent of surface (about 45 square feet) was so exposed in both cases.

When experiments of this kind are conducted in a manner liable to little error, evidence of their accuracy will arise from independent sources, and we possess direct means of verifying the correctness of the principal results obtained, viz., that the Reciprocating required 19 per cent. more steam than the Disc Engine, for equal effect.

The counter informed us that the Reciprocating Engine made in the 6 hours $14978\frac{4}{10}$ double strokes, which multiplied into its capacity* (passages, &c. included) gives a total of $78,726\frac{4}{10}$ cubic feet, as the volume of steam which passed through the cylinder at the absolute pressure of 40 lbs. per square inch. The ratio of the volume of water contained in that steam is as 1 to 677.

* The passage equalled 0·405 cubic feet.—Total capacity, 5.256 cubic feet.

The capacity of the Disc Engine* was also exactly ascertained; it was filled and evacuated $42{,}322\frac{8}{10}$ times during the 5 hours and 57 minutes; and the total volume of steam expended amounted to $69{,}535\frac{1}{2}$ cubic feet, having a mean absolute pressure of 38 lbs. per square inch, for which the ratio of the elementary water is as 1 to 710. By comparing the quantities of water given by this method of computing the respective consumption of each engine, it appears that the Reciprocating would necessarily require $18\frac{3}{4}$ per cent. more water than the Disc Engine, which confirms the correctness of the two experiments.

There are still a few points which I feel called upon to note, as they affect, to a certain extent, the results of the trials.

The Disc Engine was quite new, and therefore its acting surfaces were not in that high state of polish I have seen in those which have been in constant use for many months. Thus somewhat more power would be consumed in overcoming its own friction in this case, than in older engines. On the contrary, the Reciprocating Engine had been at work for a period which had brought its rubbing surfaces into a perfect state. The Disc Engine, also, was planted, temporarily, on the wood floor of an upstairs room being simply bolted down to sleepers; and the manner in which the driving strap was obliged to be rigged, for the purpose of the trial, increased the friction of the engine shaft on one journal. Though the practicability of such an arrangement exhibits a property of much importance to the employers of engines, viz., the small mass and cost of foundation necessary for the Disc Engine, yet, it is unquestionable that the circumstances referred to were adverse to this engine in a comparison as respects economy.

I have already alluded to another circumstance which was adverse to the economy of both engines, viz., the surface of steam pipe, and &c. exposed to the influence of the air in the building, and amounting to about 45 square feet. By experiments on a large scale, and pursued for a lengthened period, which I have made with steam under similar circumstances, and at similar pressures to those used on this occasion, I have found that 1 square foot of cast-iron pipe will condense fully 1 pound of steam per hour. Thus, about 270 lbs. of water should be respectively deducted from the consumption of the Disc and Reciprocating Engines, as those quantities had no share in the production of the effect. Making this deduction, it comes out that the effective horse power was really obtained with $82\frac{6}{10}$ lbs. of water as steam, per hour, by the Disc Engine, and with $99\frac{3}{10}$ lbs. by the Reciprocating Engine.

In concluding this statement of the results attending an investigation alike interesting and valuable, as regards the practical facts elicited, I must express my entire confidence in their accuracy, checked as my observations were throughout by so many competent persons, all of whom were most diligent in guarding against error during both trials. I am not acquainted with any experiment in which the same load, without the slightest change in any part of the intermediate gearing, has been made the medium of deciding on the comparative merits of different steam engines; and had I to choose again, I do not think a resistance could be selected subject to so little variableness as the fans adopted on this occasion. This kind of resistance offers peculiarly accurate means of noticing the quantity of irregularity occurring in the speed of any engine. The uniform velocity obtained by the Disc Engine was very apparent, and struck me as a property of no small importance as regards its application to various purposes, for which an equable rate of motion is a desideratum.

I am, Gentlemen, your obedient servant,
(Signed) JOSIAH PARKES.

12, Great College-street, Westminster,
February 3, 1842.

P. S. In compliance with a suggestion of the patentees, I have visited several of the Disc Engines on which I made a series of experiments in January of last year; I have, also, communicated with all the gentlemen employing these engines which then came under my notice. The engines referred to have now been working upwards of eighteen months, and in addition to my own perception that they are in perfect order, I am informed, in reply to my applications, that they have been in operation with constant regularity, also that the cost of repairs during the above period, had been so trifling as to be unworthy of mention.

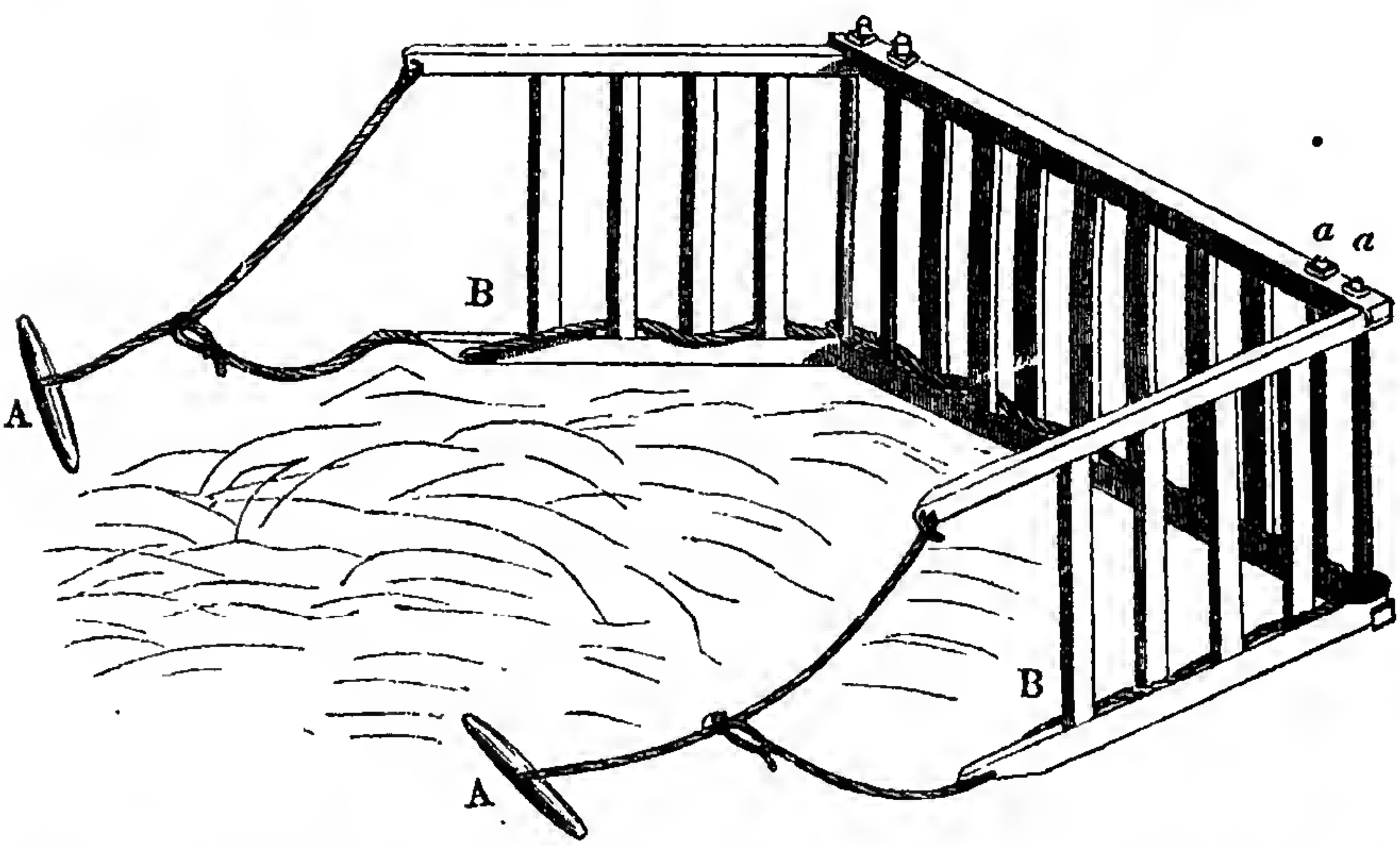
J. P.

* Disc capacity, 1·643 cubic feet.

HAY SWEEP.

Sir,—With this you will receive a rough model of an instrument used in the north of England in hay-making, and which they call a hay sweep. The description that accompanies the model is, I think, sufficiently clear for *any rough carpenter* or *wheelwright* to make one by, and the cost of the one I saw was only 25*s*. The machine from which I made this model was drawn by two horses, which were driven by two men, who, each placed one

foot where the letter B is, and another foot on the rope to keep it down, and guided the horses with long reins. To keep themselves steady, they rested their arms on the top rail, one looking to the right, and the other to the left, to guide their horses; but I think, if there was a sufficient weight attached to, or fixed *on* each end, that there would be no occasion for any one to stand there;



the horses might then be led by even two boys.

I think this would be an exceeding useful machine in all moderately level pastures, and, although it has been used for many years in the north of England, I never saw it elsewhere.

I remain, Sir, your obedient servant,
M. S. R.

Description.

This machine should be made of oak, except where the uprights, *a a a a*, are, and those (four) should be of iron; the bottom parts, with flat or round heads, let in neatly, so that the bottom should be quite level, and the tops fastened by screws and nuts.

The top and bottom rails are 4 inches by 3, or 14 inches circumference. Length of the back or centre part 8 feet; ditto of each side or wing 4 feet 6 inches; depth all round, 3 feet 6 inches. The two sides, or wings, are so fixed as to move backwards or forwards by turning on the *outward* iron bars, which pass through holes, thereby affixing the wings to the centre. These iron bars should be *round*.

A *strong* rope is interlaced through the rails near to the bottom, and that is connected with the top by a smaller rope; and at each end is a splinter bar A A, to which a horse is affixed.

This machine is of great service in catching weather, when your hay is nearly made, and when to prevent its being wetted by sudden rain, you wish to get it up in large cocks. The present plan to accomplish this, is by the men pushing it up with forks, but by the machine more may be got up in *one hour* than *many* men would be able to do in a day.

Where the rick is made in *the same field*, or in one of several *hay* fields *adjoining each other*, the time and trouble of carting is saved, for, by this machine it may be drawn up at once to the place where the rick is to be made, and only two horses are required.

THE DISC ENGINE AND CAPTAIN CARPENTER'S PROPELLERS.

We noticed some time ago the scientific arrangements adopted in the fitting out of the steam frigate *Geyser*, and also the adaptation, which was in progress, to the pinnace of the vessel, of one of the well-known disc engines and of the steam propellers invented

by the commander of the Geyser, Capt. Carpenter. The advantage expected from having the pinnace thus equipped was, that she might be able to tow the other ships' boats, against wind and tide, into shallow harbours and rivers where an armed force might be wanted, but which the vessel herself could not, from her draught of water, penetrate. Two trials of this auxiliary pinnace steamer were made last week on the Thames, in the presence of Sir Edward Parry, Comptroller of Her Majesty's Steam Marine, and Messrs. Ewart and Lloyd, the Government Engineers, and the result, as reported to us, was in the highest degree satisfactory. The pinnace is 30 feet in length, 9 feet wide, and is capable of carrying 8 tons. She is remarkably bluff in the bows, and therefore not adapted for high velocities; but power (a *little* power only) and not velocity, is what is aimed at in the present instance. The disc engine with which she is fitted weighs altogether but 6 cwt., and measures 3 feet by 1 foot 6; leaving ample space for a full complement of men. The connexion between the engine and the propellers (of which we gave a full description in our *No.* 844, p. 18) by means of grooved pulleys, and catgut bands. During the first trial, a regular speed of 7 miles per hour *through the water* was obtained, as indicated by Massey's log, although from the unfavourable shape of the boat, a wave of nearly 18 inches deep was carried before the bows. The velocity of the engine-shaft was 200 revolutions a minute, and more than that is not, we understand, desired from the propelling shafts. In the second trial, the pinnace drew after her at about the same rate of speed, a regular gun-boat, furnished with cannon, and a complement of fifty men, with their arms and ammunition. The engine and boiler are so fitted to the pinnace, that they can be taken out in five minutes, and replaced ready for operations in the same brief space of time.

WALKER'S HYDRAULIC ENGINE.

Sir,—Walker's hydraulic engine is deservedly attracting great attention, and the better it is understood, the more it will be admired. Your last Number (975) contains three papers, in two of which Mr. Walker's invention is adverted to rather disparagingly. The first is a rival, (S. P.,) who favours us with a modification of the "powder puff pump" of the sixteenth century. "The spiral wire, tube of mackintosh cloth, or of leather," bespeak the ephemeral character of such a machine, and stand little chance with a competitor which threatens to last almost for ever—and a day. "S. P." has seen Mr. Walker's machine, but from the concluding paragraph of his "description," he evidently has not yet mastered its *modus operandi.*

Mr. Tozer (page 315) endeavours to prove a want of novelty, by bringing forward the contrivance of a Mr. Wood. Mr. Walker's Belgian patent was at first refused in consequence of a supposed resemblance between his contrivance, and that of Mr. Wood; on examination, however, the two inventions were found to be *dissimilar*, and the patent was passed.

It is not at all probable, if this excellent mode of raising water had been once hit upon, that it would ever have been lost, though we are told, by the by, that the thing is a "perfect fallacy;" so saith Mr. A. Emslie, at page 315.

That it is *perfect*, I will not assert; that it is *no fallacy* has been incontrovertibly proved. I have watched the progress of this invention from its first germ to its present maturity, and Mr. E. might have been contented to take my description, or to bring against it the result of some practical experiment. Mr. Emslie says, "The lift does not discharge the water," and upon that reasoning he builds his hypothesis of the similarity of Mr. Walker's engine to a lift and force pump. The fact is, *the lift does discharge the water!* This is seen plainly enough in filling Mr. Walker's glass elevators; it is also shown by making the *down stroke* so slowly as to be inoperative, when the *up stroke* performs its own peculiar office. The fact is also shown by filling the elevators, and removing them from "the water in the well cistern, or what-not," when their contents are still delivered without any aid from the "consequent resistance."

Mr. Emslie further says, "I defy Mr. Baddeley to show that this weight of water is in any way counterbalanced by the other elevator, while in action." Mr. Emslie's defiance will not induce me to undertake the part of showman; but Mr. Walker has shown to thousands, and, I dare say, will show to thousands more, that which Mr. Emslie cannot comprehend. The mode of demonstration resorted to by Mr. Walker, is simply to detach one of the elevators from the beam; on working the machine, the quantity of water then raised is just one-half, *but the labour is nearly doubled!* On refixing the elevator, and working the machine, the quantity of water is doubled, and the labour reduced as before, affording the most unequivocal proof of the advantages of the equilibrium to which I alluded in your 971st Number.

Mr. Emslie may depend upon it there is more in Mr. Walker's hydraulic engine than was ever dreamed of in his philosophy, and

under these circumstances he will not be required to exhibit *the other disadvantages* attending this "*wonder working*" machine.

Whenever Mr. Emslie can produce a liftiug or forcing pump, which, worked by one man, will, with a twenty feet lift, raise one hundred gallons of water per minute—then, but not till then, will he be in a position to compete with that which he "considers a *perfect fallacy*."

There is no violation of any of nature's laws in Mr. Walker's engine, but he has contrived to employ a principle hitherto but partially available; all that has been published respecting it is the result of *actual working*, free from all theoretical or speculative ideas, and writers may as well attempt to deny the laws of gravity, or of falling bodies, as to gainsay the performances of the "momentum engine."

To all who can, I would say, "see it;" to those who cannot, I would merely say, "believe those who have seen it."

I remain, Sir,

Yours respectfully,

W. BADDELEY.

29, Alfred-street, Islington,
April 19, 1842.

WALKER'S HYDRAULIC ENGINE.

Sir,—It will probably have been observed by the parties most interested, that to obtain the greatest effect from a given power, the velocity of Walker's hydraulic engine should be made to depend upon the number of oscillations made by water in an inverted syphon of the same length as the lift.

Your obedient servant,

S. Y. (An Engineer.)

April 16, 1842.

INSTITUTION OF CIVIL ENGINEERS.—MINUTES OF PROCEEDINGS OF SESSION, 1842.

February 15.

"*On the Mode practised in India for obtaining Solid Foundations for Bridges, &c., in Sandy Soils, by Means of Wells.*" *By Captain Goodwyn, B. E., Assoc. Inst. C. E.*

Pileing for the foundation of buildings appears to be entirely unknown in Hindostan; the ordinary mode of securing a foundation, where the super-stratum is tenacious, and rests upon loose sand, is to dig a well until water is reached; a curb of timber is then placed, and upon it a cylinder of brick, 7½ feet exterior, and 3½ feet interior diameter, is built to the height of 3 or 4 feet above the ground. As soon as the masonry has hardened sufficiently, the well-sinker fixes a plumb-line to the top of the cylinder as a guide, and descends withinside, carrying an instrument called a "Phaora, or Mamooti," somewhat similar in shape to a hoe; with this he excavates the earth until the water is too deep; he then commences the use of the "Jham," which resembles the "Phaora" in shape, but is about 36 inches long and 27 inches wide, and is suspended to a cord passing over a pulley above the cylinder. Upon this instrument the well-sinker descends, and diving into the water excavates with the "Jham" the soft earth under the sides of the curb, and is at intervals drawn up with the instrument. The cylinder descends gradually from 6 inches to 2½ feet per day, as the earth is withdrawn from beneath it, and relays of workmen keep it constantly going, lest the sand should settle around it, and cause it to hang up. The natives are very expert in this operation, and not unfrequently remain under water more than a minute at a time. The cylinders have been sunk as deep as 40 feet; but with extreme labour.

A series of these wells being sunk at intervals of 1 foot between them, they are filled with a grouting of lime and rubble-stone, and separately arched over; arches are then thrown transversely from the centre of each parallel pair, and another set of arches turned over the adjacent wells longitudinally; the whole is then covered with masonry, and the pier or other building raised upon it: such foundations are found to answer perfectly in situations where almost any other kind would be washed away.

The communication was accompanied by a drawing of the process, and of the tools used, showing also the modification of the system proposed by Colonel Colvin, of the Bengal Engineers, for obtaining foundations for a curtain, or line of wall, by sinking square masses of brickwork, with two or more wells in each, through which the workmen could excavate the soil.

In answer to questions from the President, Captain Goodwin observed that the greatest peculiarity of this system was that the sinker worked under water: such had been their custom for ages. Upon this kind of foundation, many of the large fortresses in India were constructed, and they stood remarkably well; whereas if timber piles had been used, the white ant would have destroyed them in a short time.

Lieutenant Sale observed that another main reason for not using piles was, that timber was scarce and dear, whereas labour was plentiful and cheap. Hence the general use of the brick cylinders.

Mr. Parkes conceived the most ingenious parts of the proceeding to be, the sinking through the water, and thus avoiding the risk of bringing up large quantities of sand, and the combination of arches, for distributing the weight of the superstructure equally among the brick shafts. Such shafts had been used by the Chinese, and sunk in the same manner from time immemorial.

In answer to a question from the President, Mr. Simpson described the process now so much practised for sinking wells through bad strata by means of cast-iron cylinders; excavating the earth from within the cylinder by an instrument called a "miser," which is a conical iron shell with a valve opening inwards: it is suspended by iron rods 1¼ inch square, and worked from the level of the ground without pumping up the water: it is not uncommon to excavate to a depth exceeding 100 feet in that manner. The "miser" can bring up a cube yard of earth each time it is raised. Cast-iron cylinders are preferable to brick shafts, which frequently hang up, and in that case give much trouble, whereas if the iron cylinders do not descend freely, they will bear the application of considerable force to drive them down. They are frequently forced through the indurated ferruginous gravel. Light planking is also sometimes used, particularly in such cases as in the well he is now sinking at Chelsea, which is 20 feet square, lined throughout with 3-inch planking. It has reached the quick sand at a depth of 32 feet, and will be stopped there.

Mr. Davison had just completed a well at Messrs. Truman and Hanbury's brewery, with cast-iron cylinders, 8 feet diameter, and 193 feet deep, an account of which he promised to present to the Institution.

The President was now sinking a set of cast-iron cylinders through sand which was liable to be washed away; they were to be filled with concrete, and used as the foundation for a lighthouse at the Point of Air. An account of the construction was, he believed, preparing for the Institution.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

WILLIAM NEWTON, OF CHANCERY-LANE, CIVIL ENGINEER, *for certain improvements in engines to be worked by gas, vapour, or steam.* (A communication from a foreigner residing abroad.) Rolls Chapel Office, April 14, 1842.

"The process constituting this invention consists in submitting ether or volatile liquors to the action of heat in order to convert them into elastic vapours, and cause them to act on the piston of an ordinary engine, and when they have produced their effect, in condensing them to their liquid state, in order to introduce them again into the generators, that they may be a second time converted into vapour, which may act on the piston of the engine, and so on successively. To produce these objects, two methods may be employed. One consists in producing or generating and employing gases and ether at so trifling an expense that they may be allowed to escape into the atmosphere after having operated on the piston of the engine. The second method consists in producing a given quantity of the agent, and employing it over and over again in a machine constructed in such a manner as to prevent the loss and escape of any particle of the same. The second method is preferred, as the expense of employing ether and volatile liquors would otherwise be an obstacle to their being used. The heating and vapourizing of the ether, or other volatile liquor, requires a boiler of a peculiar construction, and a condenser of a novel construction is necessary for reducing them from the gaseous to the liquid state, after they have produced their effect on the piston; and further, a new or improved apparatus is required as a substitute for the stuffing-boxes. This apparatus exerts an elastic pressure on the rods which are to move without any escape of vapour, which pressure may be increased or diminished at will, and any escape of vapour effectually prevented. The facility with which ether and volatile liquors are converted into vapour when submitted to heat, and also their inflammability, render it impossible to expose them to the direct action of fire, as an explosion might be produced by the sudden generation of a great quantity of gas; water and steam must therefore be used as a medium for transmitting heat to them."

The patentee afterwards explains that the substances which he proposes using as "substitutes for steam," (of water) are "sulphuric ethers, hydrochloric ether very pure, and with reference to volatile liquors, ammoniacal gas, which liquifies with great facility." "The ether employed," it is added, "ought to be very pure, otherwise it would corrode the boilers and cylinders."

A description of a boiler follows, (illustrated by numerous drawings) which it is said will "answer the purpose very well." It consists of two parts; first, "an external boiler, which receives the direct action of the fire;" and second, "an inner boiler, which contains the motive agent." The second boiler communicates by means of a pipe with a condenser, "into which any superabundant quantity of gas is conducted when the pressure exceeds the prescribed limit."

The working cylinders are of the ordinary

form. After the ethereal vapours have done their duty there, they pass through an eduction pipe, to a series of pipes surrounded by cold water, where they are recondensed, or, in other words, reproduced in a state fit for renewed use.

The "new and improved apparatus," which is to be used "as a substitute for the (usual) stuffing-boxes," and on the hermetical closeness of which the efficiency of the whole affair entirely depends, is thus described, (omitting the references to certain illustrative drawings which accompany it):

"The cover or upper plate of the cylinder of the engine carries a cone, which is fixed to the plate by its base. Over that cylinder a small cylinder is placed, the cover of which likewise carries a cone. The piston-rod passes through both cones. A leather, saturated with oil or fatty substance, and thus made pliant, is rolled in a spiral direction round the piston-rod and cones. This leather is held only by a tape or twine, which is wound round it in a helical direction, to prevent it from unrolling. Between the leather and the internal sides of the cylinder there is a space which must be filled with liquid fat or oil. A reservoir contains the oil to be employed in the operation; and there are pipes for conveying the oil as it is forced by a pump into all parts of the apparatus. There is also a reservoir of air compressed by the liquid forced by the pump, the object of which is to render the pressure elastic. A valve is provided for the escape of any superfluous oil; which valve is loaded by means of a lever and weight, and is furnished with a funnel and pipe for reconducting into the first reservoir the oil which escapes through the valve. A meter is added on the compressed air principle, for indicating the pressure produced on the stuffing-box. It is by the indications of this instrument that the engineer regulates the degree of pressure which the weight ought to produce on the valve."

"In order to place the leather on the piston-rod, a rod of the same diameter is employed, and on this rod the leather is to be rolled, having the edges previously pared, well prepared, and perfectly smooth on one side of its edges. Then roll it with the hand and as evenly as possible on the rod, so that it be wound round and round two or three times. The leather thus rolled is retained by means of a tape coiled round it. These preparations made, the cover of the small cylinder is removed, the piston being then at the bottom of the other, (the larger or working) cylinder. Then place the extremity of the rod on which the leather is wound round, on the top of the piston-rod, and slide the leather gently from one rod to the other. The leather descends until it reaches the cone, (of the working cylinder) which being very sharp at its upper end penetrates a certain distance into the circular cavity formed by the leather, and slightly distends the leather. The cover of the small cylinder is then put over the piston-rod, and as it descends to its place, the cone (attached to it) enters into the cylindrical cavity of the leather. The bolts are then tightened gradually, and the cover of the small cylinder brought carefully into contact with the working cylinder, when the leather covers both cones."

The above substitute for a stuffing-box may, it is said, "be used not only in the before described (gas) engine, but also with any steam engines actually in use."

A contrivance is described for "lubricating the piston when necessary;" and also "a cock or a valve, to be used instead of the ordinary cock for retaining very volatile fluids."

The patentee desires it to be understood "that the boiler containing the water and steam which transmits heat to the ether and volatile liquors, and converts them into vapour, should be provided with safety-valves, water-gauges, proof-cocks, and all other accessaries, generally adapted to steam generators."

No claim is made. The public are left to gather from the description given what "the improvements" are which the patentee considers to be new; and this is a sort of labour which the Courts have decided a patentee has no right to cast on the public. The double boiler we do not think is new. The substitute for the ordinary stuffing-box is new, and, moreover, a very ingenious contrivance, which, though it may never be of any use in its native application to ethereal vapour engines, may probably be applied with advantage to high-pressure *steam*-engines. The patentee (or, more properly speaking, the foreign author of "the communication" to him) gives us to understand in the introduction to his specification, that he has actually succeeded in obtaining a motive power from ethereal vapours "employed over and over again in a machine constructed in such a manner as to prevent the loss and escape *of any particle of the same;*" but that the machine he has described is capable, even with its ingenious packing apparatus, of accomplishing such a prodigy, or even of reaching within many degrees of it, we hold to be a most chimerical expectation. There could not fail to be very great waste; and, according to the inventor's own showing, unless there is no waste at all, there is nothing to be gained by the adoption of his machine.

Moses Poole, of Lincoln's-inn, Gent., *for certain improvements in fire-arms.* (Being a communication from a foreigner residing abroad.)—Enrolment Office, April 16, 1842.

The improvements comprehended under this patent relate solely to fire-arms with revolving breeches, and consist, 1. In so constructing them that by simply pulling and letting go the trigger, one barrel is discharged, and the next in the circle of barrels brought round to be fired off; so that the gun may be discharged as many times as there are barrels, without once moving it from the shoulder; and 2. In making the locks of such fire-arms without either hammer or cock.

When the trigger is pulled, it pushes forward a small spring barrel or case, which by means of a connecting collar and link, brings a moveable stop inside of the revolving breech round upon the nipple of the first of the loaded barrels in order to be fired, and by its forcible contact with the cap fixed upon it, causes it to explode. On withdrawing the hand from the trigger, the spring barrel and stop return to their original positions, while the breech, with which the trigger is also connected, (by means of arrangements similar to those commonly adopted in guns of this class, and not necessary therefore to be here described,) revolves so far as to bring up another loaded barrel ready to be discharged in the same way as before. Should it be desirable to cease firing after the discharge of one or more barrels, there is a stop below the lock, by pressing on which the whole of the mechanism is made fast.

The claim is, "1. To the mode of constructing fire-arms with revolving breeches in such manner that the action of pulling the trigger will discharge the gun, and by withdrawing the pressure therefrom, the breech will revolve, and bring up a fresh barrel to be discharged, the other parts returning to their original position.

"2. To the mode of constructing fire-arms with revolving breeches applied thereto, in such manner as to dispense with the cock or hammer, by bringing each nipple having a cap thereon, successively in contact with a moveable stop, which will explode and so discharge the gun."

NEILSON'S HOT-BLAST PATENT—IMPORTANT TRIAL.

Jury Court, Edinburgh—April 1—5.

J. B. Neilson and others, v. *Househill Coal and Iron Company.*

[The *Lord Justice Clerk* and a special jury commenced to try the issues between the parties on Friday, 1st of April, and so extensive was the investigation, that the case occupied six days.]

This was an action of damages for the contravention of a patent for "an invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required." The claim of the patentee is in these terms:—"I, the said J. B. Neilson, do hereby declare, that my invention for the improved application of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required, consists in introducing into, and applying to the fires, forges, and furnaces, atmospheric air, in the following manner, &c."

The following were the issues:—

"It being admitted, that, on the 1st day of October, 1828, the pursuer, J. B. Neilson, obtained letters patent under the Great Seal used in Scotland, in place of the Great Seal thereof, and duly enrolled a specification in terms of the proviso contained in said letters patent:

"It being also admitted, that the pursuers, other than the said J. B. Neilson, have acquired, by assignment from him, a joint interest with him in the said patent:

"Whether, in the course of the year 1840, and during the currency of the said letters patent, the defenders did, in or at their iron works at Houschill, by themselves or others, wrongfully, and in contravention of the privileges conferred by the said letters patent, use machinery or apparatus substantially the same with the machinery or apparatus described in said specification, and to the effect set forth in the said letters patent and specification, to the loss, injury, and damage of the pursuers?"

The damages were laid as follows:—Profits claimed, as at the date of the action, 10,000*l.*; other damages, as at the same date, 2,000*l.*—Total, 12,000*l.*

Mr. Rutherford opened the case for the pursuers in an address of upwards of two hours' duration. The following among other witnesses, gave evidence in favour of the pursuers:—

Professor Forbes, Chair of Natural Philosophy in University of Edinburgh.
W. Gregory, Esq., Professor of Chemistry, King's College, Aberdeen.
Dr. Andrew Fyffe, Lecturer on Chemistry, Edinburgh.
George Buchanan, Esq., Civil Engineer, Edinburgh.
David Mushett, Iron and Mine master, at Coleford, Gloucestershire.
William Jossop, Esq., of the Butterly Iron Works, Derbyshire.
Alvan Penileo, Esq., Mining Engineer, Workington Hall, Cumberland.
Alexander Christie, Esq., of the Muirkirk Iron Works.
John Holdsworth, Esq., of the Coltness Iron Works.

John George Bodmer, Esq. Engineer, Manchester
William Silverwood, Esq., Civil and Mining Engineer, Derbyshire.
Alexander Buttery, Esq., of the Monkland Steel and Iron Company, &c. &c.

The *Solicitor General* (M'Neill) then addressed the jury with great ability for the defenders, and afterwards called several witnesses (chiefly from London).

Mr. Rutherford replied for the pursuers in an eloquent and powerful speech.

The *Lord Justice Clerk*, after giving full directions to the jury as to the law of the case, went over the principal parts of the evidence. In concluding, he informed the jury, that, if their verdict should be for the defenders, they would simply find for them on all the issues; if, on the other hand, they should find for the pursuers, then he considered it would be expedient, with a view to the after-procedure in this important cause, that they should embody in their verdict answers to the three following questions:

"Whether the invention, as described in the said letters patent and specification, is not the original invention of the pursuer, the said J. B. Neilson?

"Whether the description contained in the said specification is not such as to enable workmen of ordinary skill to make machinery or apparatus capable of producing the effect set forth in the said letters patent and specification?

"Whether machinery or apparatus constructed according to the description in the said letters patent and specification, is not practically useful for the purposes set forth in the said letters patent?"

The jury, after retiring for an hour and a quarter, returned a verdict for the pursuers, on all the issues, at the same time adding, in terms of the suggestion of the court, the following special findings:—

"And further find, that by the description in the said specification, the patentee did not refer to any particular form, or shape, or mode of construction, of the air vessel or vessels, or receptacle or receptacles, in which the air under blast is to be heated.

"And further find, that by the use of the term "effect" in the specification, the patentee did not state that the form and shape of the air vessel, or vessels, were material for the purpose of heating the air in such air vessel, or vessels.

"And further find, that the terms of the specification respecting the air vessels, or receptacles, and the size and numbers thereof, are not such as to mislead persons acquainted with the process of heating air, so as to direct and cause them to construct the vessels in a form or manner contrary to the ordinary and necessary rules to be attended to in heating air, passed into vessels for the purpose of being heated under the progress of the blast.

"And they assess the damages at 3060*l.* sterling."

[It was proved in evidence, that the defenders, from the time they began to smelt iron, to the date of the summons executed against them, had smelted 1700 tons of iron, so that the sum of 3060*l.* of damages is at the rate of 1*l.* 16*s.* for every ton of iron smelted by them.]

NOTES AND NOTICES.

Impure Air.—Dr. Reid, in his lectures on chemistry, mentions the following simple and satisfactory experiment for the discovery of impure air:—A spoonful of lime should be injected into a beer bottle with water, and being placed where suspicion is attached to the quality of the atmosphere, the presence of impurity would be tested by the appearance on the surface of a white and copious incrustation.

English and American Tools.—All kinds of moulding planes, more particularly beads, hollows, and rounds, are cheaper in the United States than in England, in consequence of machinery being employed in manufacturing them, to a considerable extent. With these exceptions all other edge tools are dearer in the United States than they are in England. Axes made in England of the American pattern and quality, would pay well as an investment to take out: they may be purchased at 6d. per lb. The best axe and hammer maker in New York is an Englishman, named Standish, in Perry-street—his price is 3 dollars for a broad axe of 9lb.; this is the lowest. The felling axe, of about 6lb., sells from 1½ to 2 dollars. One reason why the American axe is superior to those imported, is because the steel is welded to the end of the iron, instead of being put between two layers of iron, as in England, by which it is apt to peel, when using the axe sideways.—*Le Cras.*

New Salt.—M. Laurent announces that he has obtained a new salt, the "isato-sulphate" of potash, by treating isatine with the bisulphate of potash. This salt presents a new type of crystals; it is isomeric with the indigo-sulphate of potash, but it possesses different properties. Acids give a precipitate of isatine, and disengage sulphurous acid.

Feeding Poultry.—Professor Gregory, of Aberdeen, in a letter to a friend observes—"As I suppose you keep poultry, I may tell you that it has been ascertained that if you mix with their food a sufficient quantity of egg-shells or chalk, which they eat greedily, they will lay, *cæteris paribus*, twice or thrice as many eggs as before. A well-fed fowl is disposed to lay a vast number of eggs, but cannot do so without the materials for the shells, however nourishing in other respects her food may be; indeed a fowl fed on food and water, free from carbonate of lime, and not finding any in the soil, or in the shape of mortar, which they often eat off the walls, would lay no eggs at all with the best will in the world. Lay this to heart, and let me know in the spring if the hens lay two, or two for one."—*Liverpool Standard.*

Science in High Life.—A letter from Dublin of the 16th instant, written by a gentleman who was present on the occasion of casting a gigantic speculum which has been undertaken by Lord Rosse (late Lord Oxmantoun), and quoted in the *Times*, says—"Nothing could be more successful than Lord Rosse's operation, nor more beautiful than all his arrangements. The casting was made at nine at night of yesterday, (15th inst.) and byten we witnessed the building up of the monster speculum of 6 feet diameter, and weighing 3 tons, in a hot

oven, built expressly to contain it, and where it will remain for the next two months, which time will be necessary for that gradual cooling process to which it must be subjected. It is fine thing to see a man of Lord Rosse's station, instead of applying a strong mechanical genius, as is often the case, to nick-nackeries, at once attacking the most important and arduous problems, and forwarding the highest branches of science. During the very delicate and difficult experiment of yesterday, he was perfectly cool and decisive, and amidst various suggestions from the bystanders, quietly followed his own judgment, which was better than any of them. His present achievement, should it finally prove quite successful, is of the greater value, since the mere expense is quite beyond the reach of an ordinary professional man. This last operation, after having satisfied himself of the manner and practicability of each part of the proceeding, could not have cost him less than £1,000. If the final result proves satisfactory, which there seems no reason to doubt, he will have reached, in the opinion of scientific men, the *maximum* of effect that is attainable, since the eye, as they affirm, could not make use of a larger speculum than about 6 feet diameter."

Great Colliery Tunnel.—The Victoria Tunnel, constructed for the conveyance of coals from the Leazes Main Colliery, and Spital Tongues Colliery, to the river Tyne, near the Glass House Bridge, Ouseburn, has been completed, after a labour of two years and ten months. The tunnel, which extends under the Barras Bridge down the Dene, is two miles and a quarter long, and seven feet six inches high; it has been constructed, at a great expense, by Messrs Porter and Latimer, the owners of the Leazes Colliery, to enable them to ship their coals on the Tyne. The engineer is Mr. Gilhespie, who has displayed great skill and perseverance in conducting this great undertaking to so successful and satisfactory a termination.—*Mining Journal.*

Electric Dyeing.—Mr. Baggs has discovered a method of applying the oxides of various metals to the purposes of dyeing cotton cloths by the agency of electricity. He showed, last week, at the Polytechnic Institution, an experiment or two to prove the practicability of his invention.

Experiments with Jeffery's Adhesive Composition.—Amongst the numerous inventions submitted to the Lords Commissioners of the Admiralty, and referred by their Lordships to the Committee of master shipwrights recently sitting at Woolwich dockyard, was a composition to be used in place of the substance with which vessels are at present caulked, to render them water-tight. The experiments ordered to be made by the master shipwrights to ascertain its value when applied to the purpose for which it is intended, and the result, are interesting and satisfactory. Two pieces of African teak, a species of wood difficult to be joined together by glue, on account of its oily nature, had a coating of the composition applied to them in a boiling state, and in a short time afterwards bolts and screws were attached to each end, the joined wood placed in the testing frame, and the power of Bramah's hydraulic engine applied to the extent of 19 tons, when the chain broke without the slightest strain being susceptible where the joining took place. A larger chain, of one inch and a half in diameter, was then applied, which broke with a strain of 21 tons, the joint in the wood remaining apparently as firm as at first. The utmost strain the cement can bear in this form, therefore, remains to be proved when experiments are made with larger chains. Four pieces of hard wood were then joined together, weighing in one piece 44 cwt., and carried to the top of the shears in the dockyard, a height of 76 feet, from which it was precipitated on the hard granite wharf wall below, without any of the joints yielding in the smallest degree. The result of these severe tests induced the Lords Commissioners of the Admiralty to communicate with Lieutenant-General Sir George Murray, G.C.B. and G.C.H., for the purpose of making experiments with it in the marshes, by bringing the full force of cannon balls against it. Accordingly, a number of planks of oak 8 inches thick and fir 16 inches square were joined together with the cement, to represent 8 feet in height and eight feet in length of the side of a first-rate ship of war, without any thing else in the shape of bolt or security to assist the composition; and it was, on Tuesday, set up as a target at the butt in the marshes. Three new 32-pounder guns were placed at 400 yards distance or point blank range, and three shots fired. The effects were wonderful, tearing the wood to pieces, and in only one instance, where the joint had not been good, showing that they had any effect upon the cement, so as to separate the joined parts from each other. A hole six inches and a quarter in diameter was then bored in the centre of the target and a 32-pounder shell inserted, and exploded by a match, which tore the wood to small splinters without in many places in the least separating the composition. This new invention is said to possess the power of expanding like India rubber in warm climates, and will not become brittle under the coldest temperature.—*Times.*

Magnesian Cement.—The valuable properties of magnesia, in the composition of hydraulic cement, were first brought to the notice of the Madras Government by Dr. Macleod, and applied in reparations of the fort in 1825. About a twelvemonth afterwards, a comparative trial was made between a cement of the calcined mineral mixed with sand, a cement of lime and ironstone, and common chunam plaster, applied to portions of the same wall. After a heavy monsoon the magnesian cement was found to be the hardest and strongest of the three; and was thought to be fully equal to Parker's cement. The price at which the two cements could be procured at Madras was then equal; but, chiefly in consequence of the discovery of large deposits of the magnesia on the banks of the Cauvery, near Trichinopoly, the magnesian cement can now be produced at less than one-sixth of its cost at that period. A claim to the discovery of this mineral was made a few years ago by Col (now General) Pasley, who was unacquainted with Dr. Macleod's experiments; but on an investigation of the matter, made by the authorities in England, the claim of the latter gentleman was clearly proved, and a handsome donation of 3000 rupees was made to him by the East India Company.—*Lieut. Newbold.*

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HOLCROFT'S PATENT PORTABLE SAFETY BOAT OR PONTOON.

Fig. 1.

HOLCROFT'S PATENT PORTABLE SAFETY BOAT OR PONTOON.*

To a people so eminently and essentially maritime as the English nation, an invention which gives additional safety to mariners and others, who are led by the necessities or the vicissitudes of life to traverse the ocean, cannot fail to be regarded with deep interest by the whole community.

The vast increase that has taken place of late years in the numbers of those who daily seek that occupation and subsistence in the cultivation of land in the colonies which are denied to them on their own soil, renders it a matter of the highest importance to ensure to them during their passage to the distant shores of Australia or the Canadas, a greater degree of safety than now unfortunately has been found to exist; so that in case of any sudden disaster at sea, and whilst distant from any human aid, the mariners may be able to command within their own vessel the means for ensuring an escape from the horrors of a death by drowning, or the still more horrible one of destruction by fire.

The instances, far too numerous to particularise, which are on record of the loss of human life at sea, arising from the destruction of ships by fire or water, offer one melancholy reflection to the observer—namely, that the majority of these fatal occurrences have been the result of an insufficiency of boats, wherein the crew and passengers could seek a temporary refuge; and it has hitherto been found totally impossible to remedy this evil, inasmuch as the bulkiness and unaccommodating form of the boats at present in use render it a matter of difficulty to find safe stowage even for the scanty and limited number that are at present to be found on board of merchant and passenger ships. The consequence of this inadequate supply of boats has been, in most cases where the number of passengers and crew has exceeded that which the boats could contain, to occasion the most awful and desperate struggles for priority in obtaining a place in the boats; which has in some cases ended in the swamping of the boats, from the multitudes that rushed into them in the hope of escaping death: or else in a catastrophe still more frightful to contemplate, namely, the violent ejection or murder of the weakest, in order to lighten the overburdened barque—as was seen not very long ago in the case of the American ship *William Brown*, the crew of which saved themselves in this horrible manner at the expense of the lives of those whom they were bound to protect and to save, even to their own detriment.

It needs, therefore, no very elaborate exordium to prove that at the present the principal reliance for the safety of those who "go down to the deep in ships," is more in the protection which a gracious and ever-merciful Providence is always ready to afford his creatures, and in the goodness of the ship, and skilfulness in the mariners, than in any hopes of escape by means of the boats which are carried on board emigrant and merchant vessels. The invention, therefore, of a boat which should combine portability, capacity, lightness of draft, capability of being contained in a small compass, and unconquerable buoyancy, and which to those essential qualities should add that of being economical in its construction, both in materials and labour,—has long been a desideratum.

Many persons have obtained patents for inventions within the last fifty years, purporting to be boats for the preservation of life in shipwrecks and storms; and the four quarters of the globe have furnished those who have engaged in the endeavour to construct such a boat, with models of various degrees of merit: but hitherto, notwithstanding the numerous efforts that have been made, nothing which can really claim to be successful has as yet been achieved. The Greenlander, the Esquimaux, in common with the fisherman of the Coromandel coast, have furnished their leathern skiffs, or their fibre-sown massoula boat, as models; and the results, as exhibited in the life-boats of Captains Manby, Basil Hall, and many others, have been so far good that they have replaced the clumsy fabrics that were formerly in use for the purposes to which they are applied. Still there remains to be overcome the hitherto insuperable difficulty of furnishing a cheap, safe, light and portable boat, which shall serve the purposes of the mariner

* Patent dated October 28, 1841; Specification enrolled April 28, 1842.

whilst engaged on distant voyages, and be equally at the service of the fresh-water sailor, or finally be adapted to the important services so often required by our troops in the passage of torrents and rivers during a march through an unknown or hostile country.

The invention which is now offered to the public will, it is hoped, supply the lamentable deficiency which is above shown to exist; and, as the number of those who seek for food and employment in distant colonies is, owing to the constant and progressive increase in the population, yearly multiplying in numbers, it becomes a matter of the highest importance to provide additional means for their safe passage across the ocean, or, at all events, for their temporary safety, in case of accident to the vessel which conveys them. The great difficulty in the way of providing an adequate number of boats for the safety of crew and passengers, has hitherto been, as already intimated, the unwieldiness and bulkiness of the boats at present in use. There can, according to the present mode of constructing them, be no more boats carried in every merchantman than can accommodate from forty to sixty persons;

Fig. 2.

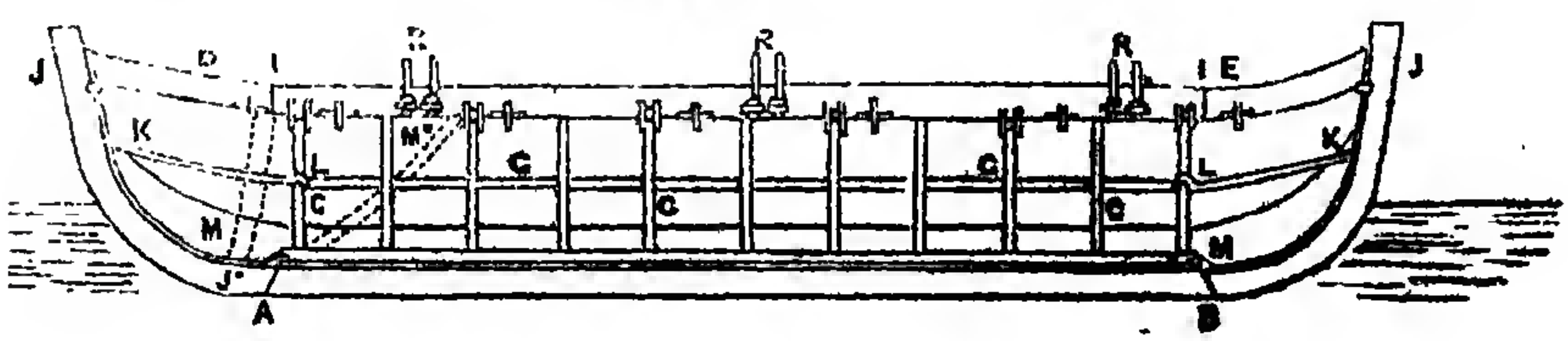


Fig. 3.

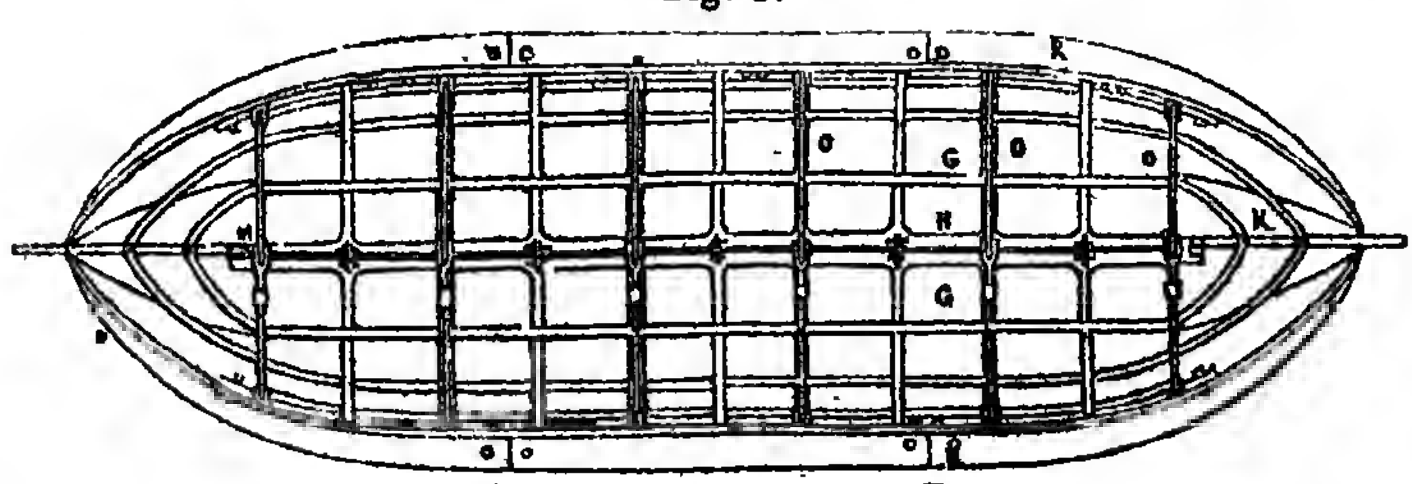
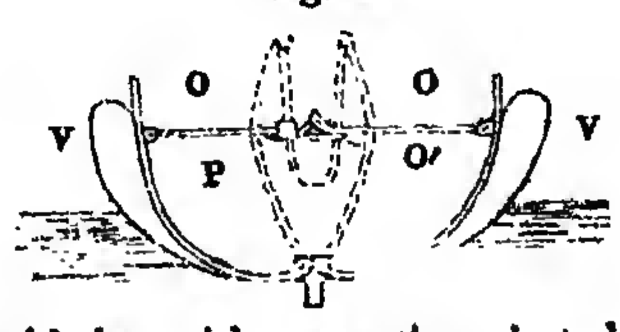


Fig. 4.



and even this number would be with difficulty contained in them, not to speak of the room required for water and provisions. The number of passengers and crew on board of emigrant ships is frequently double that above mentioned; and hence, in cases of shipwreck, foundering, or other casualties incidental to sea-voyages, there is always a prospect of those horrible struggles for preservation amongst the unhappy sufferers which have been before referred to.

The boat in question is of French invention, but has been patented in this country as well as in France. It is constructed upon the principle of a skeleton frame, easily put together, and as easily disconnected and folded in a small compass. The skeleton is constructed so as to fold easily and commodiously into one-sixth of the space which it occupies when it is expanded and put to its proper use as a boat; and it is covered over with two folds of canvass of the best and strongest quality, which, after having been previously prepared with dissolved

caoutchouc, are glued one to the other, on the inner side of each, by a solution of the same material, so as to form an impenetrable and durable covering, wholly impervious to water, and more capable of resisting a sudden shock from breakers or sunken rocks, than either oak or the strongest deal planks would be. To provide for the permanent and unconquerable buoyancy of the safety-boat, it is provided with air-cells, or cases partitioned off, and each rendered independent of the other, so that in case of an accidental fissure being made in any one of these cells, the remainder, being uninjured, enable the boat to preserve its buoyancy.

The strength of the canvass can be increased at pleasure, according to the size of the boat, or the mode in which it is to be employed, so as to give this material a degree of strength equal to that of sheet iron; while its pliability adds greatly to the safety of the boat, by enabling it to sustain the shock of an accidental encounter with a rock or other hard body, by which an ordinary boat would be staved and swamped. The interior of the boat may, moreover, be strengthened to any degree required by the employment of thin sheets of iron or planks of wood, disposed so as to form a commodious bulwark and footing along the sides and bottom.

Having thus sketched, in a cursory manner, the advantages and facilities which at the first aspect of the invention are suggested to the mind, it may be advisable to examioe what has actually been achieved by the employment of boats constructed upon this principle, of the materials indicated, in the kingdom of France; and as these facts are on record as having taken place under the immediate cognisance of the Minister of Commerce, the Duke of Orleans, and various other persons of the highest rank and of the first intelligence in France, they, perhaps, will serve in some degree as an apology for what might be said of the capacities of this patent boat. In the *Journal des Débâts* of April 21, 1841, we find the following description of one of these boats:—

"We have recently spoken of the new patent boats, which take to pieces, and are readily constructed, and which were lately exhibited in minature on the Seine.

"A trial of far greater importance was made, of their powers of conveying merchandise, in the presence of the Minister of Commerce yesterday, which was also witnessed by a vast number of spectators.

"The first large sized boat of this description reached Paris from Auxerre after a passage of unusual rapidity, and equal freedom from accidents of every description. Notwithstanding many severe concussions to which the boat was purposely subjected during the passage,—notwithstanding, also, the lack of water, which delayed the passage of other boats on the river; and many other drawbacks, as well studied as accidental,—not the slightest injûry was sustained hy the hoat, which preserved its form, as well as the solidity of its frame, most perfectly; nor was there the smallest leakage to be perceived. When it is stated that the boat was of the following dimensions, it will at once he perceived that the principle upon which it is proposed to construct them has heen subjected to the severest test which could be devised, and that it has endured it with success:—The length of the boat was 32 metres, 25 centimetres; the breadth was 5 metres, 10 centimetres. The cargo, brought from Auxerre, (in the centre of Burgundy,) consisted of 17 decasteres of new wood, weighing 89,862 kilos, (80 tons, 5 cwt.;) 4,000 metres of wood in planks, weighing 1,8000 kilos, (16 tons, 1 cwt.;) and several hogsheads of wine, weighing 2,138 kilos, (2 tons,) making altogether 110,000 kilos (98 tons, 6 cwt.) of cargo, which was safely delivered at the Quai d'Orsay. As soon as the cargo was discharged, the boat was taken to pieces, (which was effected in three or four minutes' time,) and heing placed on two carts, the materials were conveyed to Auxerre, to he again put together, and floated down the stream with another cargo. This experiment, therefore, amply testifies to the strength and powers of resistance of the materials of which these boats are constructed; and as their facility of setting up and taking to pieces depends wholly upon their size, it will be found that five minutes, upon an average, will suffice to ship or unship a boat large enough to carry with ease and safety from twenty to forty persons."

In a mere preliminary sketch such as this, it is unnecessary to expatiate upon the numberless ways in which this invention may be turned to account. It offers to those who are fond of aquatic pleasures a safe and inexpensive means of pursuing their amusements: a folding boat, constructed upon the principle herein described, may be carried by one man to the water's edge, expanded and fitted out in a few minutes' time, and

launched upon its native element with a facility equal to that of expanding an umbrella. The various uses to which this invention may be turned, need only be hinted at to render them obvious to the dullest imagination. Pontoon boats, whaling skiffs, wherries, punts, and all the various kinds of boats, whether used for pleasure, commercial or warlike purposes, or in Polar voyages of discovery (where a portable and easily stowed boat would be an invaluable aid) can be alike constructed upon the principle, and formed from the materials used in these boats.

The means of providing safety for his crew and passengers, however numerous they may be, are here provided for every mariner in command of a vessel; and whether she be a majestic ship of 120-guns, or a mere chaloupe, the same means are equally available; whilst the stowage-room required for any number of boats will be greatly less than that required for the boats now in use. Independently, likewise, of this consideration, which in itself is of no mean weight, is another of almost equal importance, namely, the the cost of each boat would not amount to more than that of the fabrics now in use; and when to these two features is added a third, of far higher importance than all the rest put together, namely, that the patent boat is incomparably superior in point of safety to every other invention that has yet been laid before the public,—it is conceived that the invention has claims to the attention of the Government of this maritime nation which no other novelty in the way of the useful arts has ever yet possessed.

H.

Description of the Engravings.

(From the Patentee's Specification.)

Fig. 1 is a perspective view of an exploring party provided with one of the boats, the details of the construction of which are shown in figs. 2, 3 and 4.

Fig. 2 is a longitudinal section; fig. 3 a plan; and fig. 4 a cross section of the boat or pontoon.

A B is the keelson, C C C are ribs which spring from the keelson to which they are secured by the swivel joints H and I'. D E is a gunnel, to which the ribs are made fast at top, and which is jointed at I I, just beyond the last rib at each end. G G G are side-pieces, which bind the ribs laterally together, being nailed, or otherwise secured to them, about half way between the keelson and gunnel. I J M are the stem and stern-pieces, which are secured to the keelson by nuts, M M, and connected to the nearest ribs by the links K L, K L, which links turn on joints at K K, and are attached by hooks and eyes to the ribs at L L. O O are girders, by which one half of the ribs (that is to say every other rib) is connected transversely at top; they are linked to the tops of the ribs by swivel joints, and are jointed at the middle, but to support them at the middle joints when extended, each rod has a short under-stay O', which is secured at one end to one-half of the rod, while the other is made fast by a ring P, which slides on the other half of the rod, and is just large enough to come over the understay, when brought forward to the centre of the rod. R R are the rollocks for the oars. The parts before described constitute the framework of the boat or pontoon, and may either be of wood, or cane, or metal, or any other strong but light substance which will answer the purpose, excepting only that the joints, links, and rings, should, in every case, be of metal. When the framework of the boat has been thus put together, it is covered up to the edges of the gunnel with any of the approved sorts of waterproof canvas, or with thin sheets of metal, protected from oxydation (as far as may be) by suitable coatings, which covering is to be nailed, or otherwise secured to the gunnel. To the stem and stern and sides of the boat, floaters V V V, are also attached, consisting of hollow air and water-tight cases, made either of metal, or of some other impervious material, or consisting of cases filled with cork-shavings, or other substance of the like small specific gravity, or consisting of large pieces of solid cork; and these floaters, when consisting of cases filled in either of the modes aforesaid, are divided into compartments, two, three, four, or more, so that in the event of one compartment being damaged so as to let in air or water, the injury may not extend to the other compartments, and the boat still remain insubmergible. When the boat is not required for use, it can be folded up so as to carry on the shoulder, or under the arm, like an umbrella. For this purpose the nuts M M, which secure the stem and stern pieces to the keelson, are to be first unscrewed, and then the eyes L L, by which they are connected with the nearest ribs, unhooked, after which the links K L are to be turned in their joints K K, till they are in a line with the keelson; the stem and stern ends of the gunnel doubled down at the joints I I, till they are in the position indicated by the dotted lines J J, fig. 2; and the cutwaters J J brought round into the position indica-

ted by the letters M M in the same figure. The rings P P are then to be moved back, so as to set free the under-stays, O¹, which will allow the transverse girders O O, to yield at their middle joints. By then pressing the ribs G G G together, the whole apparatus will be brought into the folded-up position indicated by the dotted lines in fig. 4.

FOUR AND SIX-WHEELED ENGINES.

It is so very manifest a thing, that a carriage running on parallel rails must be safer with six wheels than with four, that one cannot help wondering that it should ever have been a subject of controversy among any considerable portion of a "thinking people," especially in an age so *mechanical* as that in which we live is said to be. It may serve however to diminish our wonder if we call to mind, that it is not long since it was debated just as seriously, whether such carriages could run at all—whether with six wheels or with four.

Indeed it would almost seem as if it were but of the order of things that mankind should never hit on any really useful discovery in art or science, without hatching at the same time (by way of set-off to their merit?) some most extravagantly ridiculous whim or project. The same age which saw the lightning drawn at the will of man from the heavens, saw its learned circles divided into the knob and point factions, and royalty throwing its weight into the scale of error and absurdity. The same age which has seen the Atlantic bridged, as it were, by the steam power of England, has heard of our sinking hundreds of thousands of pounds to bore a hole under the Thames, that we may cross it on foot rather than steam it over head. And now that we have by great good luck found out that a steam carriage will run of itself on rails at the rate of from 20 to 40 miles an hour, without the help either of ground diggers, drag-chains, or cog-wheels—now that this happy discovery is producing such vast and beneficial changes on the face of society—behold our wise men and wiseacres engaged in a hot discussion, whether there is more safety in travelling at such prodigious velocities on four wheels or on six! Would that the folly of the thing were all! The four-wheel faction of our times is unfortunately a very powerful faction—powerful from the accidents of wealth, and place, and station—powerful from the bull-headed confidence which is ever natural to ignorance—a faction able to give practical effect on a fearfully large scale to its nonsensical preferences—and not very caring (apparently) how much society may suffer from them. It is a fact now established beyond all question, that the persistence by certain of the railway companies in the use of four-wheeled engines has been attended with a great sacrifice of human life. And it is also a fact, that, untaught by the past, and deaf to all remonstrance, they still persist in the use of the same sort of engines, at the imminent risk of illustrating, by many more homicides (*murders* would perhaps be the more appropriate term) the prodigious evil which stupidity in office is capable of inflicting on the community.

The four-feeted—we beg pardon, four-*wheeled* wrongheads—would not probably be so slow of comprehension, or so obstinate of purpose as they are, but for the self-elected champions, that is, the writers or scribblers of their party—men who, from their literary or scientific attainments, would be of no earthly use to the right side of any question, and for that very reason fasten with leech-like tenacity on the wrong side of this. Writing only for the gratification of their personal vanity, they seek nothing less than to elicit the truth; and belonging to a public body more remarkable, perhaps, than any other in this country for its exclusion of men of literature and science from its ranks, they find it a matter of but small difficulty to make "the worse" appear to those about them "the better reason." To be "a wit among lords" is proverbially easy; but not more so, we fancy, than to play the part of a seeming learned man among Railway Directors.

With what absurdities—what sillinesses—what fallacies—what misrepresentations—what downright false-*hoods* the cause of the four-wheel faction has been maintained (in the absence of all reason and common sense,)—it would take more time and space to relate than we can afford to so unprofitable a theme. We shall be the more readily excused for passing them over without more special mention when we state, that we have ourselves no intention whatever of joining in the fray. Our only purpose in now adverting to the subject, is to introduce and

commend to the notice of our readers an extract from the Report of the last monthly meeting of the Liverpool Polytechnic Society, which appears to us to comprehend in a few words the whole pith and marrow of the question at issue. A long paper had been read by a four-wheeler "On the comparative merits of four and six-wheeled locomotive engines" and it was thus well replied to on the instant by the chairman of the meeting, John Grantham, Esq., C. E.

"He would reply to Mr. ——'s arguments in the order in which they were introduced, but he must first explain a very common error into which the public are led while discussing the comparative merits of four and six-wheeled engines. Inside bearings and round fire-boxes are by many persons supposed to be alone applicable to the former, while outside bearings and square fire-boxes are supposed to be essential to the latter. He need not say how erroneous this opinion is, but till men divest their minds of this impression the subject must remain undecided—till this distinction is made all the lengthened papers in the *Railway Journals* stand for nothing. There was no reason why the square fire-box and the outside framing might not be applied to the four-wheeled engine, or the round fire-box and inside framing be adapted to the six-wheel engine. Such changes had been made, but were not general. For his part he was inclined to prefer the round fire-box and inside framing. The subject, however, for discussion at the meeting was simply as to the comparative merits of locomotives having four and six wheels. He had been engaged in the construction of several of each description, and had of course frequently travelled on them; and from his own observation he was led to the opinion that engines with four wheels were more unsteady than those with six wheels, and that this defect more than counteracted all the advantages to be derived from the saving in friction of the extra wheels. He thought the appearance alone, as exhibited by the drawings, even to an unpractised eye, would strengthen his arguments in favour of six wheels. Some serious accidents had happened to four-wheeled engines, that he believed would not from similar causes have occurred to six-wheeled engines. He did not allude to the collisions that had taken place on various occasions; all engines were alike endangered from those casualties, but he alluded to those cases in which no satisfactory reason could be assigned. The comparative cost of four and six-wheeled engines of the ordinary construction is, as Mr. —— stated, about 20 per cent in favour of the former; but this difference arises chiefly from the outside framing and the copper fire-box, and does not materially depend on the number of wheels. He would not say any thing as to the comparative cost of repairs, but would leave this subject to the directors of railways. He might, however, state it as his decided opinion, *that the first consideration for directors is, which plan will insure the greatest safety to those who unsuspectingly place themselves under their protection.*" Mr. Grantham concluded by expressing his conviction, that as a separate question, the principle of six wheels was superior to four.

DR. NORMANDY'S SOAP PROCESS.

"How are you off for soap?"
Popular Sayings.

Sir,—in a late Number of the *Mech. Mag.* (No. 975) I observed in the list of "Abstracts of Specifications of English Patents Recently Enrolled," a notice of the invention of "Alphonse René Le Mire De Normandy, Doctor of Medicine, for certain improvements in the manufacture of soap," which improvements appear to consist in a very liberal admixture of "the salts of potash and soda." I must confess I am not much of a chemist, and certainly never was a manufacturer of soap, but it does not, I fancy, require a great deal, either of chemical knowledge, or of manufacturing practice, to see that these alleged improvements are altogether fallacious. It is stated that "these substances are introduced into the soap (when the saponifying process is *complete*, and it is ready to be cleansed) either in the solid state, in pulverised masses, in the state of crystals, or in the state of crystals melted in their water of crystalization, or else dissolved in steam or water." But if the process of saponification is to be first complete, where is the good of the addition? Where the saving? I hate being uncharitable, particularly towards that class of *soi-disant* public benefactors yclept inventors; but really, Sir, it will require the explanations of some one whose lot has been cast in a much more fortunate die than mine, to disabuse me of the idea that this Doctor Normandy's invention consists of any thing more than a patent mode of selling cheap neutral salts for a price at least ten times more than they cost in their original state. I am strongly impressed with a notion that by the Doctor's admixture of them with soap, the public would be *defrauded* in two ways, viz: first, by paying ten times the proper value of these sulphates, which I conceive to be a useless addition; and,

secondly, by again paying for carbonate of soda (or common washing soda) the price of soap, when every washerwoman knows that that material may be had in retail for 1½*d*. or 2*d*. per lb.

My interest in the soap market goes no farther than my business demands, being,

A SHAVER.

P.S. The adulteration of common soda is practised to a monstrous extent. In a future communication I will explain an easy, cheap, and infallible mode by which the public may detect the fraud.

S.

April 21, 1842.

DESCRIPTION OF WHITE'S DISCONNECTING CRANK FOR PADDLE-WHEELS.

[COMMUNICATED BY THE INVENTOR.]

Fig. 3.

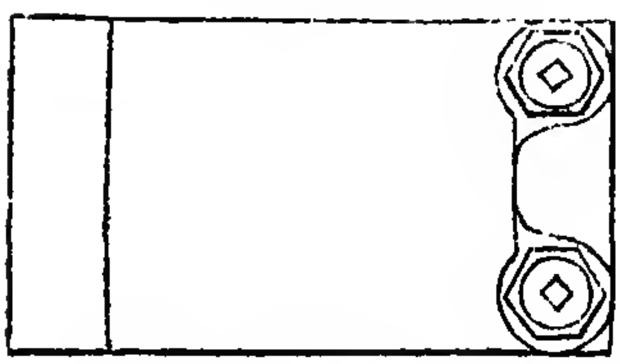


Fig. 4.

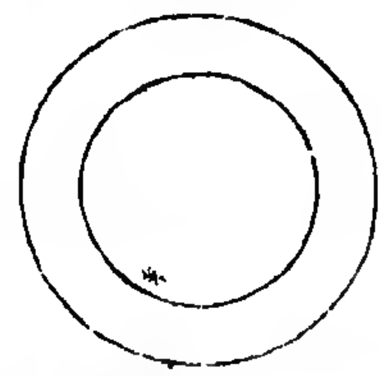
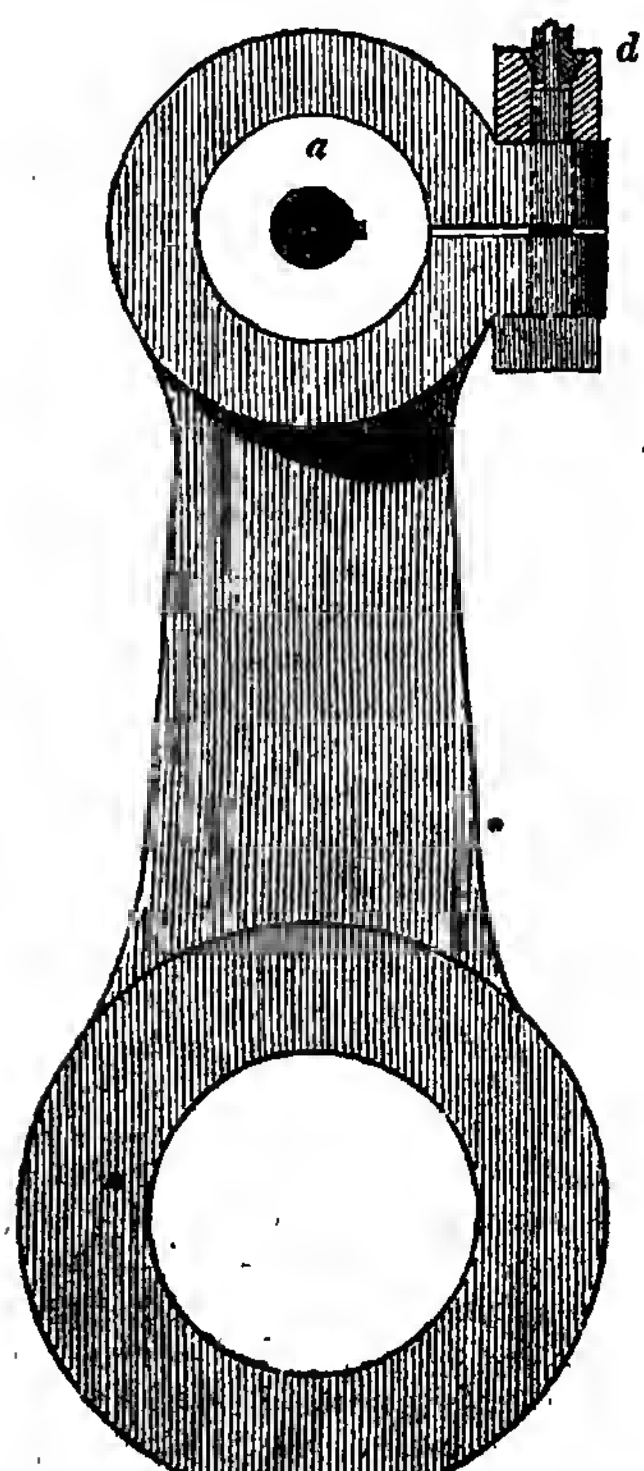
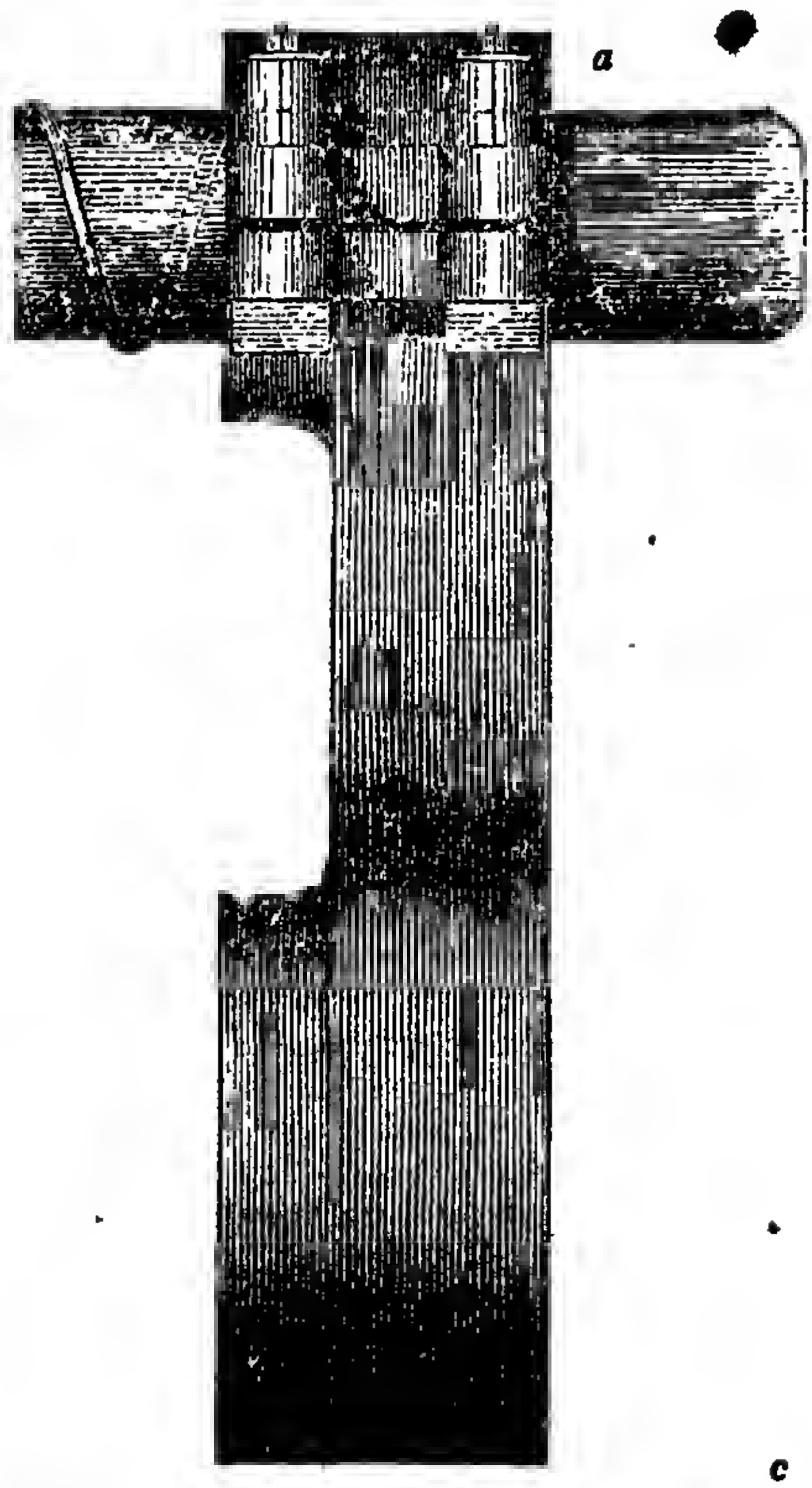


Fig. 1.



d Fig. 2. b



The crank, which is represented by the accompanying drawings, is intended for marine engines, with the view of affording the greatest possible facility in disconnecting paddle-wheels, which has been found a matter of great importance

to steam frigates, especially when on a cruising expedition.

The principle is simple, and may be readily adapted to any marine engine without farther expense than a new crank and crank-pin to each paddle-wheel. This is an advantage which some of the other modes in practice do not possess, where no previous preparation has been made for the improvement.

It will be seen by fig. 2, that *a* is the crank-pin; and if we suppose the dotted line *b c* to be the face of the crank on the paddle-shaft, the paddle-wheel, with the pin so situated, would be disconnected with the engine. The space shown between the dotted line *b c*, and the end of the pin *a*, prevents the crank on the paddle-shaft touching the brasses of the connecting-rod when the crank is revolving with the engine at rest, as would be the case, were the vessel sailing without the aid of steam; and when the paddle is connected with the engine, the space alluded to is occupied by the ring, fig. 4. The end of the pin *a*, which has the spiral upon it, fits a corresponding groove within the eye of the crank, and by simply turning the pin once round by these spiral planes, the paddle-wheel is connected, or disconnected, as it may happen. When the paddle-wheel has been disconnected by withdrawing the pin *a* to the position represented by fig. 2, before the end of it can be replaced into the eye of the crank on the paddle-shaft, it will be necessary to fix the paddle-wheel at that point, which brings the eyes of the two cranks quite fair. To effect this several plans might be suggested, but perhaps none is better than having a small portion of the outer rings of the paddle-wheel toothed, and provided with pinions of sufficient strength for moving and retaining the wheel to suit that purpose.

When the pin *a* is being moved, the bolts and nuts *d d* are sufficiently slack to admit of its being turned round, by the leverage of a strong key, applied to a hole in the end of it, as shown in fig. 1, and when the paddle is connected with the engine, these bolts and nuts are screwed up as tight as possible. To prevent the large nuts *d d*, which fix the pin *a*, becoming slack during the continued working of the engine, there are others, having a conical seat, which are let into the former, and these have a left hand thread; by this contrivance, any tendency the large nuts may have to slacken, would instantly be checked by the small nuts, and thus remove all danger of the pin getting loose after it has been properly fixed.

We are now to suppose the wheel connected, and the pin *a*, as firmly secured in the eye of the crank as bolts and nuts can make it. But then comes the question—is it as firm by the plan which has been described, as if the eye of the crank had been shrunk upon the pin in the ordinary way? No; neither is it requisite. By the latter mode there is no elasticity in the grip, nor any way to refix the pin properly in the event of its coming loose, which is a good reason for the excess of metal in the eye of a crank that is shrunk upon a cold pin. The plan I propose is different in principle. The pin is retained by an elastic grip from the construction of the crank; and if properly made in the first instance, while that elasticity remains, no strain the pin is exposed to will ever shake it loose, and if, by any other chance, it were to be so, the labour of a few minutes would suffice to refix it.

Fig. 3 is a view of the top of the crank, showing the double nuts, and the two projecting lugs through which the bolts

For engines of great power, three bolts may be used to each crank, and if 2 inches in diameter, they would be found strong enough for the largest steam-vessel in Her Majesty's service.

JAMES WHITE.

11, East-place, Lambeth, and Haddington, N. B.

THE PIANOFORTE—CONDITIONS OF EXCELLENCE—MERITS OF DIFFERENT INSTRUMENTS—IMPROVEMENTS SUGGESTED, &c.

SIR,—I feel an apology is due from me to yourself and the readers of your Magazine, for not having, ere this, contributed my promised communication on the action, &c., of the pianoforte, and I have only to plead in excuse the pressure of those daily avocations which, as all your readers engaged in business will not require to be informed, afford little leisure for any other pursuits.

The following conditions appear to be

indispensable to adapt this instrument to performers of ordinary abilities:—

Firstly, that the motion imparted by the finger to the key shall cause the hammer to strike the string with sufficient force almost instantly, and yet that the damper shall be removed from the strings before the hammer strikes them.

Secondly, that the hammer leave the strings instantly after the impact, for if it did not, it would act as a damper; and that it shall not be liable to return to the string before the blow is required to be repeated.

Thirdly, that the hammer can *easily* be made to repeat the blow with great rapidity.

Fourthly, that the damping apparatus shall be capable of stopping the vibrations of the strings quickly, and yet not resist the finger of the performer very sensibly.

Fifthly, that the moving parts shall not be much subjected to wear, and, its consequence, becoming noisy.

If the actions of pianofortes in general use be examined with relation to their capabilities of producing the above effects I fear I shall be justified in the opinion that there are none at present known which fulfil *all* the above conditions; in support of which opinion I will now proceed to describe the actions in common use.

The common square pianoforte action consists of a hopper attached to the key acting on a lever, technically termed the under hammer, which lifts the hammer that strikes the strings. As the hopper is constructed with an abutment below the level of its top, the lever, or under hammer, falls down upon that abutment after the hopper has "hopped off," and sustains the hammer a little below the level of the strings, which of course affords a complete facility for repeating the blow of the hammer without the key rising to its full height; indeed, the facility of repeating is so great, that after it has been some time in use, the hammer commonly repeats its blows when not required to do so. This evil has been obviated in more modern instruments, by the introduction of the check, such instruments being designated grand square pianofortes, and certainly they are a great improvement on the common square instruments; but, from the circumstance of the hopper, under hammer, and even the hammer itself working on leathern hinges, they wear rapidly. Perhaps the greatest improvement which the action of the square piano is susceptible of, would be to take away the under hammer, and make the hopper act directly on the hammer itself, or, in other words, to substitute the action of the grand piano for that of the square.

The action of the upright or cabinet piano is not very dissimilar to that of the square instrument, but the parts are necessarily disposed in a different manner to suit the altered position of the strings—the motion being communicated from the under hammer to the hammer, by means of a long wooden rod called a sticker, which is suspended from the hammer by a leathern hinge, the lower end being attached to the under hammer. This arrangement is much superior to that in the common square pianoforte, as the sticker and under hammer act as a steadying weight to the hammer, and tend greatly to prevent its returning to the string after striking it; but as the hinges have hitherto been constructed, they must wear more rapidly than bushed centres do. If the expense were not too great for the present rage for low-priced, miscalled cheap instruments, the hopper might be made to centre in the key, and the sticker attached to the butt of the hammer, by another wire centre, when its durability would be almost equal to that of a common grand action, and, having no check, it would continue to possess the advantage of repeating the blow with facility.

Upright pianofortes have been made with a jack, or lever action, and check—indeed, the first upright instruments constructed, (the upright grand pianofortes,) were so made; nor can I perceive any impossibility in making the lever or jack as high as the present hopper and sticker, so that it might act directly on the butt of the hammer, particularly in the very short instruments improperly termed picolo* pianos. Perhaps the increase of expense is the principal objection to such an action being generally used.

* The term "picolo" should, properly, be restricted to a peculiarly constructed pianoforte action, which was the invention of Mr. Wornum, but is often used to signify any very short upright instrument, even if made with the common cabinet pianoforte action.

The common grand action is superior in simplicity and durability to any other, the moving parts, excepting the keys, being all made to work on wire axes or centres; and it appears capable of fulfilling all the required conditions, excepting that of repeating its blow rapidly without requiring the key to rise to its full height. The attempts to overcome this evil have been pretty numerous, but the writer is of opinion it has never been effected, but at the expense of greatly increased complexity, and diminished durability. One of the earlier attempts, and perhaps the most successful one, is that of Sebastian Errard, in which the check is detached from the hammer by a very slight motion of the key; but this is effected by such complex machinery, that it is to be expected the effects of wear will be to cause the motion of the parts to be accompanied by considerable noise. The practical difficulty is to check the hammer sufficiently high up, without endangering the contact of the hammer with the check during its rising. The writer has a contrivance by which he hopes to overcome this difficulty, and if successful, he will send you, Mr. Editor, a figure and description of the same. But to return to the subject of durability. It is obviously a most important condition in any machine, that it consist of the fewest parts which are capable of effecting its purpose, and that it be so constructed as to be as durable as possible. Now, neither of these conditions usually result from complexity, which is a general character of the modern "patent," and other improvements in the action of grand pianofortes, particularly the attempts to revive "down striking" actions by Kohlman and others, which do not appear to have any advantages of tone which are not better obtained by placing the sound board above the strings as in the construction of Mr. Wornum; besides gravity resists, instead of favouring the return of the hammer, and the spring which does return it is felt to resist the finger as a spring damper does.

Perhaps no part of a piano wears more rapidly than the mortises of the keys which receive the steady pins by which they are retained in their places; and as any considerable looseness, resulting from wear, is accompanied by much noise, some contrivance which would either diminish wear, or readily compensate for it, would be desirable. I have been informed Messrs. Errard have hung the keys on bushed centres, and employed oval steady pins under the finger end of the keys; these being turned partly round, fill up the space produced by wear. Perhaps, if the mortises, particularly that at the end of the key which wears most, were lined with cloth, the action would not become so noisy as it usually does after being in use for a comparatively short period, to the great annoyance of those who resemble the writer in desiring to hear *tone* without noise.

If we may judge by the general absence of the means of quickly stopping the vibration of the long bass strings of grand pianofortes, we might infer there is some practical difficulty in effecting this. I think it will be found that rapid damping is best effected by increasing the surface of the damper. Any increase of its weight is very objectionable, as is also the employment of spring dampers, being felt so very sensibly to resist the finger; but if extension of surface should be found incapable of damping with sufficient rapidity, I would suggest the employment of two sets of dampers, one above and one below the strings, for the two lowest octaves of the compass, which I know from experience will effectually damp the most powerful vibrations of very heavy strings of the length of ten feet, which is fully four feet longer than the longest strings of a modern grand piano. In the case of short instruments there is no difficulty in damping, the great difficulty being to continue their vibrations.

On the proportionate lengths and sizes of the strings, depends, to a considerable degree, the obtainment of an equal quality of tone throughout the compass of the instrument; as does also even still more its standing well in tune; and should this meet the observation of pianoforte makers, I would, with all humility, beg to hint that it is a part of their business which many of them are too careless of, copying slavishly each other's scales, without first investigating the goodness of what they copy. But as it is ungracious to point out defects without suggesting remedies, I beg to offer for their adoption the following scale, which stands

well in tune, and affords a very equal quality of tone throughout, the bass being very firm and powerful.

C	$1\frac{5}{8}$	in. No.	12	wire.
	[illegible]	,, ,,	13	,,
	$6\frac{1}{8}$	,, ,,	14	,,
	12	,, ,,	16	,,
	23	,, ,,	18	,,
	45	,, ,,	21	,,
	88	,, ,,	25	,,

Your practical readers can easily discover for themselves the lengths for the intermediate notes, as also where to commence using covered strings in instruments of ordinary length, as from the length of the bass, the above scale requires a case full ten feet long.

It would appear as if a perfect scale were a matter of easy obtainment, for all the sounds in the octave can be produced by stopping the vibrations of one string at different lengths, and those lengths can easily be measured. If wire of uniform size and quality were employed, this would no doubt be the best method, but a pianoforte strung with wire of uniform size is very unequal in different parts of the compass. To avoid this greater evil we must choose the less one of using strings of different size, gradually increasing in thickness from the treble to the bass. As thick wire does not undergo so much manipulation as thin wire, its tenacity is usually less; hence one chief cause of the necessity of making the octave below less than double the length of the strings of a given note; at the same time it must not be *too* short; *no increase of thickness will compensate for want of sufficient tension*, which produces a bad tone. This is a very common defect in those notes of the piano which are immediately above the covered strings, and it renders what is termed the break in the tone very obvious.

The bracing of pianofortes is a very important consideration in their construction, although were mere capability of resistance the only consideration involved, it would not be difficult to design such an arrangement of its parts as would at once combine the least possible weight of material with the greatest strength; but this would require either that the bracing should be on both sides of the acting force, or that force on both sides of the bracing, as in Mr. John Isaac Hawkins's construction. Now, both these conditions are attended by some practical inconveniences; the former requiring so much space as to necessitate the employment of crooked keys, and the latter rendering it needful to have one of the attachments of the strings moveable, or a most inconvenient length of wire beyond the bridge, if the strings are attached to the other side of the bracing. Perhaps these evils might be avoided in upright instruments, by employing a straining force, equal to that of the strings applied at the back of the wrest plank, and to that part of the frame in front of which the strings are attached; both these parts of the instrument remaining fixed as at present, it would be needful to have a convenient means of determining the amount of the compensating force, as it might otherwise exceed or fall short of the force of tension.

In grand pianofortes it is usual to employ bracing beneath the sound board, and other bracing, technically termed *bars*, above the strings; consequently, the instruments so constructed fulfil the former condition, and are open to the same objection, viz., the necessity of using crooked keys. I think, however, when the circumstance of the different distances of the upper and lower bracings from the strings is considered, it will be obvious that the total strain is very unequally distributed on each set, for the upper bracings or bars are so much *nearer* the strings that they sustain from two-thirds to five-sixths of the whole force, which fact would suggest the desirableness of making the bars strong enough to bear the entire strain. As the bars are of iron, this might easily be done, and the inconvenience of the bracing beneath the strings, or rather a continuation of it, termed the arches, which connect the belly rail with the wrest plank be thereby avoided; for they are in the way of the hammers, and involve the consequent necessity of employing crooked keys, a disadvantage which is avoided in Mr. Wornum's construction before mentioned. Mr. Wornum's instrument has the further advantage of striking towards the sound board, though this is obtained at the expense of the bracing being as distant from the strings, and consequently from the straining force, as in cabinet pianofortes.

To carry out the above suggestion in the bracing of grand pianofortes, it would be needful to attach the barrs very firmly to the string plate, and also to the wrest plank, which may be best done by covering the latter with an iron or brass plate of sufficient thickness into which the bars should be inserted, and firmly bolted down. The covering plate also serves to prevent the wrest pins from leaning over, as it must be drilled to receive them if made as wide as the wrest plank,

I remain, yours respectfully,
ALFRED SAVAGE.
16, Garlic-hill, March 22, 1842.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

JUNIUS SMITH, OF FEN-COURT, FENCHURCH-STREET, GENT., *for improvements in machinery for manufacturing cloths of wool and other fibrous substances* (communicated by a foreigner residing abroad).—Enrolment Office, April 20, 1842.

The improvements described in this specification have particular reference to the recently introduced manufacture of cloth by felting, without weaving (though as much is not stated by the patentee himself) and seem to have for their main object to obviate the objection generally made to the felted cloths of wanting firmness of texture, by giving them a warp and woof the same as woven fabrics. Mr. Smith's invention may be described in brief as consisting in weaving sheets or layers of carded wool into cloth, whereas ordinarily the carded wool is first spun into thread, and then woven.

Four different sets of machinery are described.

1. Two carding machines (of the ordinary sort) working together at right angles: one furnishing the material to form the warp, in a thin continuous layer, and the other supplying (by means of a grooved doffer) the material to form the web or woof in successive but intermittent portions.

2. The warp and web so furnished by the carding machines passes into what is called "a receiving machine," where the materials are consolidated, interlaced, and formed into a cloth-like fabric.

3. From the receiving machine the cloth-like fabric is transferred to a hardening or jiggering machine with a perforated steam-chamber, in which machine the material is so much further consolidated and interlaced that it is made fit to undergo the ordinary process of fulling or milling.

4. With the ordinary fulling or milling machinery there is combined an overhauling machine, by which a large portion of the manual labour now required in the fulling or milling of cloth is said to be saved. By these combined machines the fabric is equalized, and stretched clear of folds and wrinkles, and made fit for finishing.

The claim is, 1. To the use of the two carding machines, so placed, and working together, that they furnish the material for the fabric with the fibres of each successive layer across the fibres beneath.

2. To the construction and use of the receiving machine.

3. The combining of the two carding machines with the receiving machine, so as to produce thereby collectively a set of machinery to form materials into cloth.

4. To the hardening or jiggering machine with the perforated steam chamber.

5. To the use of overhauling machines for stretching, flatting, and smoothing any kind or description of cloth, during the process of fulling or milling.

MARCUS DAVIS, OF NEW BOND-STREET, OPTICIAN, *for improvements in the means of ascertaining the distances vehicles travel.* Petty Bag Office, April 7, 1842.

Mr. Davis's improvements (in the ordinary odometers) consist in using a roller, which revolves by contact with the circumference of the wheel, and causing the counting part of the instrument to register the revolutions of the roller and not of the wheel; so that, as the revolutions of the roller are always the same in number for any distance gone over, whatever may be the diameter of the wheel the inconveniences arising from variations in the size of wheels are got rid of. The odometer, when thus improved, may, the patentee thinks, be more properly called a "Terrameter."

The claim is to the adaptation and application of a wheel or roller to the periphery of one of the running wheels of a carriage, or of a wheel or roller connected therewith, whereby the number of revolutions made by the wheel or roller can be ascertained, and consequently the distance travelled by the carriage.

The idea of employing such an intermediate wheel or roller is not new, but it has never before been carried into practical effect, for want of a convenient and durable method of affixing the roller, and connecting it with the registering wheelwork. Neither can we flatter the present patentee with having succeeded better than others in this respect. An apparatus such as he describes his "Terrameter" to be, would be in the "hospital" at least ten times as often as the wheels themselves, and that is oftener than would be consistent with the sound economy of any conveying or carrying establishment.

LIST OF DESIGNS REGISTERED BETWEEN MARCH 24TH, AND APRIL 27TH, 1842.

Date of Registration. 1842.	Number in the Register.	Registered Proprietors' Names.	Subject of Design.	Time for which protection is granted.
Mar. 26	1156	Henderson and Co.	Carpet	1 years.
"	1157	Patterson, Boyle and Co.	Joint for shortening the handles of parasols	3
30	1158	Henry Phillips	Button	3
"	1159	Thomas Ash	Compound disc of circular plates	3
31	1160	Thomas Marsh	Umbrella stand	3
"	1161	Ditto	Hat, coat, and umbrella stand	3
"	1162,3	Ditto	Fender	3
April 1	1164	Chadburn, Brothers	Syringe	3
"	1165	William Ford	Instrument for smoothing the exterior surface of drain tiles	1
4	1166	Joseph Baker	Pencil-case	3
"	1167	Charles Wheeler	Blind-roller	3
5	1168	Samuel Hill Smith	Knife	3
"	1169	Thomas Humphries	Carpet	1
"	1170,2	J. and T. Kipling	Ditto	1
"	1173	Henry Cope, Jun.	Lamp chimney	1
6	1174	Henry Brunton	Carpet	1
"	1175,7	Henry Cope, Jun.	Bottom of kettles, pots, &c.	3
7	1178	Joseph Morton	Fender	3
"	1179	John Hynam	Label	1
"	1180	S. Richards	Coffin furniture	3
"	1181,2	Henry J. Dixon	Carpet	1
"	1183	Henry Cope, Jun.	Bottom of kettles, pots, &c.	3
8	1184	John Sheldon	Portable letter and coin balance	3
"	1185	Joseph Schlesinger	Letter clip	
11	1186	William Blenkiron	Shirt (double breasted)	1
"	1187	R. Wilkins and M. Kendrick.	Lamp burner	3
"	1188	Ditto	Water valve	3
"	1189	Ditto	Detent for window blinds, &c.	3
"	1190	Charles Cash	Dust bin and sifter	3
"	1191	Charles Schlesinger	Music folio	3
12	1192	Frederick Long	Light extinguisher	3
"	1193	James B. Wilson	Block for hat linings	3
"	1194	B. Walton and Co.	Dish cover	3
"	1195	Ditto	Metallic handle	3
14	1196	Hutchinson, Higgins, & others	Centrifugal iron railway	3
15	1197	Robert Rettie	Machine for sweeping chimneys	3
"	1198	H. and J. Dixon	Carpet	1
18	1199	Richard Willis	Snuffers	3
"	1200	James Yates	Fender	3
"	1201	Frederick Barnett	Basting machine	3
"	1202	John Crowley	Iron lever or jack for looms	3
20	1203	John Davenport	Pocket comb sliding in case without cap	3
"	1204	Ditto	Ditto with cap	3
"	1205	Shoolbred and Co.	Dish cover	3
21	1206	H. and J. Dixon	Carpet	1
22	1207	Jno. Sheldon	Letter and coin balance and pencil-case	3
"	1208	Richard Kitchen	Skate	3
27	1209	Ridgway and Co.	Basin	1
"	1210	Ditto	Jug	1

[AGENTS FOR EFFECTING REGISTRATIONS, MESSRS. ROBERTSON AND CO., 166, FLEET-STREET.]

LIST OF ENGLISH PATENTS GRANTED BETWEEN THE 31ST OF MARCH, AND THE 28TH OF APRIL, 1842.

Joseph Cilsild Daniell, of Tiverton Mills, near Bath, for improvements in making and preparing food for cattle. March 31; six months.

Julius Seybel, of Golden-square, Middlesex, chemist, for improvements in the manufacture of sulphate of soda and chlorine. March 31; six months.

William Liversidge Trippett, of Charlton-upon-Medlock, Lancaster, agent, for improvements in looms for weaving by hand, or by power. March 31; six months.

John Bevard, of Whitehead's Grove, Chelsea, gentleman, for an improved mode of expelling the air from certain cases or vessels used for the preservation of various articles of food. April 6; six months.

James Smith, of Deanston Works, Kilmadock, Perth, cotton-spinner; and James Buchanan, of the city of Glasgow, merchant, for certain improvements applicable to the preparing and spinning of cotton wool, flax, hemp, and other fibrous substances. April 6; six months.

John Read, of Regent's Circus, mechanist; Henry Pirtland, of Hurst-green, Sussex, farmer; and Charles Woods, of Fore-street, Cripplegate, commercial traveller, for improvements in the construction and make of driving reins, harness, bridles, and reins, and in bridles and reins for riding. April 6; six months.

Jean George Sue Clarke, of Euston-grove, engineer, for improvements in supplying and regulating air to the furnaces of locomotive engines. (Being a communication.) April 6; six months.

Thomas Clive, of Birmingham, iron founder, for certain improvements in the construction of candlesticks. April 7; six months.

John Anthony Tielens, of Fenchurch-street, merchant, for improvements in machinery or apparatus for knitting. (Being a communication.) April 7; six months.

Marc Carlotti, of Little Argyll-street, Regent's-street, gentleman, for certain improvements in the construction and manufacture of boots, half-boots, shoes, clogs, and galoshes. (Being a communication.) April 8; six months.

William Falconer, of Clapham-common, gentleman, for improvements in apparatus for attaching buttons and fasteners to gloves, and parts of garments. April 13; six months.

John Byron Dawes, of Trafalgar-square, Charing-cross, gentleman, for a certain improved chemical composition or compositions, to be employed in the preparation of glass, or other media of light. April 13; six months.

John Lamb, of Kidderminster, machinist, for improvements in engines to be worked by steam, air, gas, or vapours, which improvements are also applicable to pumps for raising or forcing water, air, or other fluids. April 15; six months.

Thomas Richards, of Liverpool, bookbinder, for certain improvements in the art of bookbinding, and also in machinery, or apparatus to be employed therein. April 15; six months.

Alfred Jeffery, of Lloyds-street, Pentonville, gentleman, for a new method of preparing masts, spars, and other wood, for ship building and other purposes. April 15; six months.

Charles Farina, of Leicester-square, chemist, for a new method of manufacturing soap, candles, and sealing wax. April 15; six months.

Kent Kingdon, of Exeter, cabinet-maker, for certain improvements in impressing and embossing patterns on silk, cotton, and other woven or felted fabrics. April 21, six months.

William Noel, of Jermyn-street, St. James's, boot and shoemaker, for certain improvements in the manufacture of boots and shoes. April 21; six months.

Alphonse de Troisbrioux, of Great Russell-street, Bloomsbury, gentleman, for improvements in lithographic and other printing-presses. Being a communication.) April 21; six months.

Otto Rotton, of Gracechurch-street, doctor of medicine, for certain improvements in machinery or apparatus for spinning cotton, wool, silk, and other fibrous substances. (Being a communication.) April 26; six months.

William Wood, of Wilton, carpet manufacturer, for a new mode of weaving carpeting, and other figured fabrics. April 26; six months.

Septimus Cocking, of Birmingham, draftsman, for certain improvements in the production of light by the burning of oil, tallow, and wax, and in the apparatus for regulating and extinguishing the same. (Being partly a communication.) April 26.

Raoul Armand Joseph Jean, Comte de la Charlité, chevalier de la legion d'honneur, of Leicester-square, Richard Tappin Claridge, of Weymouth-street, gentleman, and Robert Hodgson of Salisbury-street, Strand, gentleman, for improvements in preparing surfaces of fabrics to be used in covering roofs, floors, and other surfaces. (Being a communication.) April 26; six months.

Henry Robinson Palmer, of Great George-street, Westminster, civil engineer, for an improvement or improvements in the construction of roofs and other parts of buildings, and also for the application of corrugated plates or sheets of metal to certain purposes for which such sheets or plates have not heretofore been used. April 26; six months.

Joseph Mege, of Keppel-street, Russell-square, merchant, for improvements in the making or constructing of trowsers. (Being a communication.) April 26; six months.

John Henry Pape, of Grosvenor-street, Bond-street, pianoforte maker, for improvements in carriages and in the construction of wheels. April 28; six months.

William Losh, of Newcastle-on-Tyne, esquire, for improvements in the construction of wheels for carriages and locomotive engines intended to be employed on railways. April 28; six months.

John Varley, of Colne, Lancaster, engineer, and Edmondson Varley, of the same place, cotton manufacturer, for certain improvements in steam engines. April 28; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND BETWEEN 22ND OF MARCH, AND 22ND OF APRIL, 1842.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, gentleman, for improvements in the manufacture of plaited fabrics. (Being a communication from abroad.) Sealed March 29.

James Hunt, of Whitehall, in the county of Middlesex, gentleman, for improvements in the manufacture of bricks. March 29.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattrasses, and apparatus applicable to bedsteads, couches, and chairs. March 30.

John Harwood, Esq., of Great Portland Street, in the county of Middlesex, for an improved means of giving expansion to the chest. April 6.

James Andrew, of Manchester, in the county of Lancaster, manufacturer, for certain improvements in the method or process of preparing or dressing yarns or warps for weaving. April 6.

Edmund Morewood, Esq., of Winchester-buildings, Great Winchester-street, in the city of London, for an improved mode of preserving iron and other metals from oxydation or rust. (Being a communication from abroad.) April 7.

Henry Booth, Esq., of Liverpool, for improvements in the method of propelling vessels through water. April 13.

William Brockedon, of Queen-square, in the county of Middlesex, gentleman, for improvements in the manufacturing fibrous materials for the cores of stoppers to be coated with India rubber, and used for stopping bottles and other vessels. April 13.

Christopher Nickels, of the York-road, Lambeth, in the county, of Surrey, gentleman, for improvements in the manufacture of plaited fabrics. April 13.

James Smith, of Deanston-works, in the parish of Kilmadock and county of Perth, cotton-spinner, and James Buchanan, of the city of Glasgow, merchant, for improvements applicable to the preparing and spinning of cotton, wool, flax, hemp, and other fibrous substances. April 13.

Mathias Nicolas La Roche Barré, of St. Martin's-lane, in the county of Middlesex, manufacturer of cotton, for an improvement in the manufacture of a fabric applicable to sails and other purposes. April 19.

Reuben Partridge, of Cowper-street, Finsbury, in the county of Middlesex, engineer, for certain improvements in machinery or apparatus for splitting and shaping wood into splints, for the manufacture of matches and other similar forms. April 20.

Richard Dover Chattarton, of Derby, in the county of Derby, gentleman, for certain improvements in propelling. April 22.

Theophile Anton Wilhelm, Count de Hompesch, of Burich Castle, near Aix-la-Chapelle, in the kingdom of Prussia, for improvements in obtaining oils and other products from bituminous matters, and in purifying or rectifying oils obtained from such matters. April 22.

NOTES AND NOTICES.

Birkbeck Testimonial.—A Public Meeting was held at Freemasons' Hall on Monday last, LORD BROUGHAM in the Chair, when it was resolved, 1.

That "this meeting desire to record their deep sense of the eminent services which Dr. Birkbeck has rendered to the education of the people, by founding in 1800, and teaching a class for mechanics at Glasgow, by his munificent AID IN FOUNDING, and his constant care in superintending the London Mechanics' Institution, and by his ready assistance in forming similar bodies throughout the kingdom." And 2, That "the most fitting method of testifying the public gratitude to Dr. Birkbeck, is by founding in University College, London, a Professorship of Machinery and Manufactures, including the application of Chemistry and other branches of Natural Philosophy to the Arts, (the Professor to lecture in the country during the College Vacations), and that a subscription be commenced for this purpose." The second resolution was opposed by Mr. Hodgkin, Mr. Fogo, and some other gentlemen, who seemed to think that the endowing of a Professorship in a *College* inaccessible to *mechanics*, was not the most appropriate mode that could be imagined, of perpetuating the remembrance of Dr. Birkbeck's services to *Mechanics'* Institutions; but the promoters of the meeting had previously settled the matter otherwise, and so the resolution passed in the affirmative. The words in the first resolution, which we have marked in small capitals, will strike all who are acquainted with the actual history of Mechanics' Institutions, as remarkable. The time has been, when the Noble Lord who presided on this occasion, went a great way farther. May we flatter ourselves that his Lordship has discovered that well-merited honour to the dead, is not inconsistent with justice to the living?

American Stave-cutting Machine.—A machine has been lately invented that will dress at one operation, a rough board, or rived stave of any kind of wood, into a perfect stave for the cask, giving it on both sides the round of the cask, and jointing it to its proper level and taper, at the rate of one hundred per minute, and will do the work of 100 men. It is said to be very simple, not likely to get out of order, and can be built at small expense. There is one in operation at 103, Murray-street, New York. A patent was recently obtained in England, for the manufacture of staves, the preparation of which is said to be so simple, and so effectual, as to promise a revolution in this most important branch of cooperage. An American invention of this character, called the "Patent Rotary Stave-cutting Machine," and one possessing many advantages over that used in England, is now in successful operation in this country The superiority of that used in the United States, is demonstrated by the fact, that it is more simple in its construction, is managed with more facility, and throws off, in the same length of time, a larger amount of finished stock. The two machines operate alike in cuting leaves from solid blocks of wood, previously steamed for the purposes of softening and seasoning. In both, the waste steam of the engine is used for this purpose. In both, at the expense of but two or three horses power, the wood is cut like cheese, without offering any apparent resistance to the knife, and without the slightest waste in saw-dust, shavings, or chips. In the English patent, the leaves cut from the block are passed through *two machines*, to bring them to the required shape for the cask intended. In this operation, it most essentially varies from the American patent. This, at *one movement*, cuts out the stave in the curved shape, chamfers, crozes, and pares the ends; the last three processes mentioned requiring a separate labour of hands in the English manufacture of the stave. In the operation of the American patent, it is apparent there must be a great saving of time, labour, and expense. In the science of mechanics it is one of the most important improvements of the age, and must produce an entire revolution in the trade affected by the invention.—*Le Cras.*

Jeffrey's Adhesive Composition, some remarkable experiments made with which at Woolwich, were noticed in our last (No. 976,) is now stated to consist simply of shell lac and caoutchouc dissolved in naphtha in certain proportions. The cost is about half that of common glue.

The Earl of Rosse's Gigantic Speculum, the casting of which was noticed in our last Number, is stated by Sir James South, in a letter to the *Times*, to weigh about 3 tons, to be 6 feet in diameter, 5½ inches thick at the edge, and 5 inches at the centre, and to present a reflecting surface of 4071 square inches, whilst that of the celebrated Herschel telescope had but 1811. It is to be fitted into a telescope of 50 feet focal length, but it is not expected to be cool enough for removal till after the lapse of a couple of months. The metals of which the speculum is composed, are copper and tin, 126 parts of the former to 57½ of the latter. The foundry where the casting was made is close to Birr Castle, the residence in Ireland of the Earl of Rosse, and, with the exception of the crucibles, which were made by Messrs. Dewer, of Old-street, St. Luke's, all the apparatus employed on this interesting occasion (the steam-engine itself included) was made in workshops adjoining the Castle, under the Earl's immediate directions, by workmen trained and instructed by himself.

New Egyptian Lighthouse.—Mehemet Ali, with the view of facilitating the commercial intercourse between his country and Europe, has caused a new lighthouse to be erected on Point Eunootos, near his palace at Alexandria. The tower is of stone, and 180 feet high; the lantern (supplied from England, by Messrs. Wilkins and Son) consists of 13 lamps, with parabolic reflectors. The light, which was first exhibited on the 1st inst., can be seen from a distance of 20 miles at sea. The structure was designed by, and has been executed under the superintendence of our countrymen, the Messrs. Galloway.

The Hindostan Steamer.—A magnificent steamer, of 1800 tons burden, to be called the Hindostan, has been built by Messrs. Wilson, of Liverpool, for the Oriental Steam Navigation Company, and is intended to ply between Suez and Calcutta direct, calling at Aden, and Point de Galle in the Island of Ceylon. It is hoped that when the Hindostan gets fairly at work, the whole distance from England to Calcutta will be performed in 30 days; and if she equals the Oriental and Great Liverpool in swiftness and strength, the hope will be realized. Though larger than the Oriental, the Hindostan is on precisely the same plan; and another steamer, of the same size and construction, to be called the Bentinck, also intended for the line from Suez to Calcutta, is likewise in progress. It will be no small honour to Messrs. Wilson, and to the port of Liverpool, to have furnished the steamers for the longest line of steam communication in the world, and to have supplied vessels not to be surpassed by any port or any builder in Europe.—*Liverpool Times.*

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ROBERTS'S GALVANIC BLASTING APPARATUS.

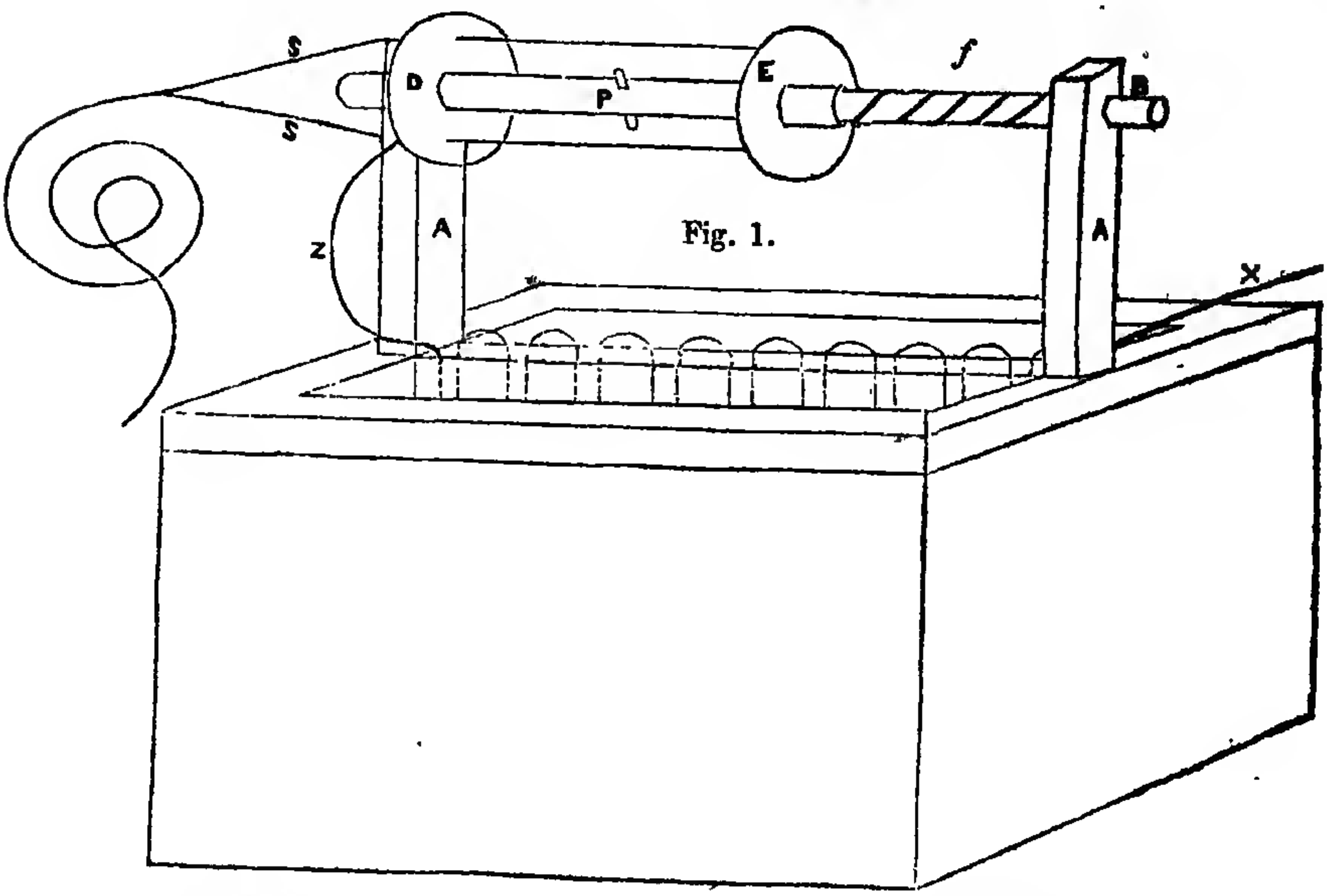
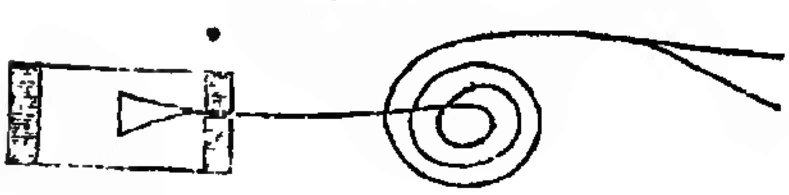


Fig. 1.

Fig. 4.



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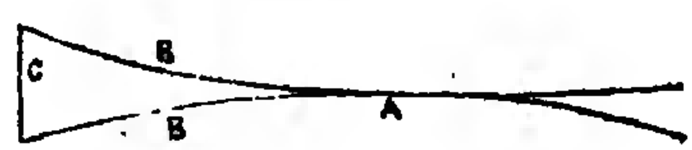


Fig. 5.

Fig. 6.

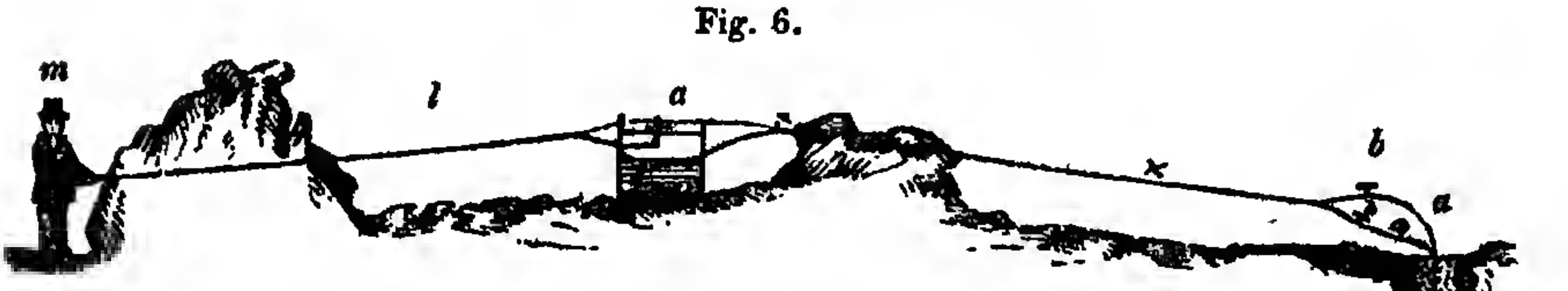
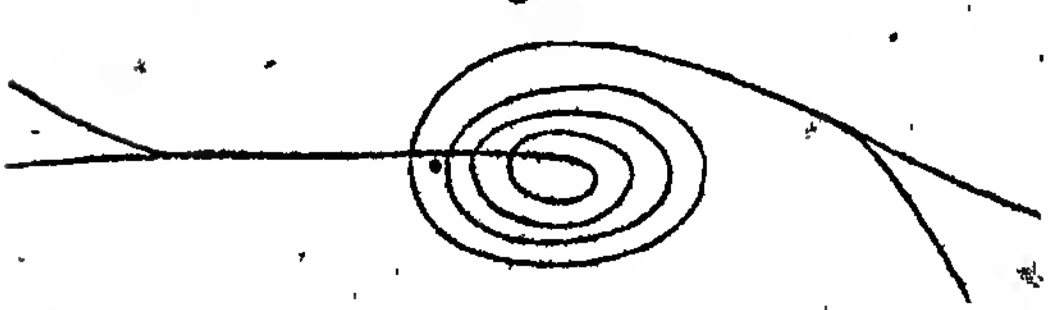


Fig. 2.



ROBERTS'S GALVANIC BLASTING APPARATUS.

We mentioned briefly in a recent number, (Notes and Notices, No. 975,) a successful application, at Wester Craig's Quarry, near Glasgow, of a mode of blasting rocks by galvanism, invented by Martyn J. Roberts, Esq., F. R. S. E. The following very graphic description of the operation, from the pen of an eye-witness, has since appeared in the newspapers:—

"The workmen, under the direction of the superintendant of the quarry, had nearly completed their part of the operations before Mr. Roberts, (the inventor,) and Mr. Wilson, made their appearance, accompanied by assistants, with the battery and connecting wires for conveying the galvanic current to the charges of powder. These gentlemen carefully superintended the placing of the charges in the rock, and connecting the main coils of wire with the cartridges. When the arrangements were completed, and it was observed that the battery was placed on the top of the precipice over the quarry—whence the distance to the charges to be fired was shortest, and entirely free from danger—the spectators, by Mr. Roberts's advice, placed themselves on the summit of the precipice, and at the outside of the curved line of the rock, from which an excellent view could be obtained of the effects. The two charges at the foot of the rock were first to be fired; and having been uncertain where I should place myself, I was in the act of moving from east to west along the top of the precipice, when the signal was given while I was immediately behind and close to the battery, at the moment the two galvanic poles were brought together. The effect was instantaneous. The hill upon which I stood was shaken to its foundation, as by an earthquake, and the riven mass of rock went crashing down into the depths of the quarry. This was startling and beautiful, but fell far short of what took place upon the second application of the galvanic current to the two charges placed over each other in the face of the perpendicular cliff. A short time was required to remove the scaffold that had been used by the workmen in preparing the two upright blasts, and in placing the connecting wires, and applying screens in front of the charges to prevent the scattering of the splinters of stone when the explosion took place; these arrangements gave me sufficient time to gain an excellent position for observation. Every thing was at length completed, and every eye then was fixed, and the breath held in anxious suspense; then came the 'ready' from Mr. Wilson, who remained in the bed of the quarry; the assistant at the battery brought the discs in contact, and the whole face of the rock was riven asunder, from top to bottom, and from 300 to 400 tons of stone were torn from the hill, and came thundering down like an avalanche. It is impossible to imagine any thing more grand or interesting than this triumph of science as applied to practical utility, in rendering a hitherto most dangerous process perfectly safe and simple in execution."

Mr. Roberts has himself addressed a long and very able letter on the subject to the Highland and Agricultural Society of Scotland; and to this letter we are indebted for the following explanatory particulars, as well as for the accompanying engravings. Persons desirous of adopting, in their quarrying or engineering practice, Mr. Roberts's process, will do well, however, to consult the pamphlet itself,* which goes much more into detail than our limits will permit us to do.

The present, or what we may hope soon to call the *old* process of blasting rocks with gunpowder, is described with truth, by Mr. Roberts, as being at once troublesome, expensive, and dangerous. The quantity of powder fired on one occasion, at Craig Leith, near Edinburgh, amounted to no less than 500 lbs.; and loss of life or mutilation of limb, from premature explosions, is a matter of almost daily occurrence.

Mr. Roberts's improved process consists, firstly, in a new method of tamping; and, secondly, in using the electric fluid to fire the charge of gunpowder, in a safer, more effectual, and cheaper way than any heretofore attempted.

1. *Of the Tamping.*

The improvement in the method of *tamping* is based upon the curious fact—that if a tube of small diameter and moderate length be filled with dry sand, no force that can be applied at one end will press out the sand at the other. Instead of ramming down a quantity of gravel and broken stones into the bore-hole, (and this with considerable danger to the workmen,) Mr. Roberts finds it sufficient that dry sand is gently poured into the hole until a column of sand is formed of about 12 inches in depth; though if the

* Longman and Co., London; Grant and Son, Edinburgh.

hole will admit of its being filled to a greater depth, so much the better. Mr. Roberts believes that many hundredweights of gunpowder would be required to blow out a column of sand 2 inches in diameter, and 18 or 20 inches in depth, placed in a solid rock. In all the experiments he has made upon blasting rocks, (and they are not few,) the sand has not in any one instance been blown out, provided it was perfectly dry, and that its depth exceeded 15 inches when the diameter of the column was under 2 inches. The danger of *tamping* by the ordinary method is thus avoided; for no rammers or stones are required, and much pecuniary loss attending the old plan is saved.

2. *Of the Electric or Galvanic Agency.*

It has long been known that gunpowder can be fired by the electric fluid. In the earlier days of electric science it was accomplished by Franklin, who generated electricity for the purpose by the common glass electrical machine. At a later period, an attempt was made to apply electricity thus produced to the firing of charges in blasting rocks, but it failed; for, in consequence of the high tension of this electricity, extraordinary precautions were necessary to confine the fluid to its proper channel—namely, the conducting wire—perfect insulation of this wire being necessary to prevent the electricity flying off to the surrounding earth. Dr. Hare, the American philosopher, seeing the inapplicability of this method of obtaining electricity, suggested the use of the galvanic battery for the purpose, but his apparatus was so cumbrous, at least so ill adapted for every-day use by unscientific workmen, that his plan was never more than very partially adopted. About two years ago, Mr. Roberts being in a neighbourhood where quarrying and mining are carried on to a great extent, his attention was called to the subject by the distressing accidents that daily occurred in the process of blasting, and he then contrived an apparatus for blasting by galvanism, which was found very efficient, and was approved of by the Members of the Royal Geol. Soc. of Cornwall, before whom he read a paper on the subject, afterwards published in the Transactions of that Society. But, as there was some trouble connected with the use of this apparatus, Mr. Roberts afterwards endeavoured to simplify its construction, that the benefits to be derived from it might be accessible to all; and after a great sacrifice of time, and the expenditure of a considerable sum of money, he had the satisfaction of perfecting it to such a degree, that any carpenter can now make it, and every workman use it with success. Experiments were made with it on blasting rocks and firing charges under water, in the presence of a deputation from the Highland Society, and these gentlemen, distinguished for their scientific attainments, expressed their unqualified approbation of the result. *After this*, Col. Pasley applied a galvanic apparatus to the firing of charges under water, but, from the want of a full description of Mr Roberts's improved apparatus, and method of firing charges simultaneously, he did not meet with constant success.

Mr. Roberts makes use of a galvanic battery similar to that of Professor Daniell, (whose employment of sulphate of copper to excite the plates, instead of diluted sulphuric, nitric, or muriatic acid, he characterizes as "a discovery" of great importance, by which the progress of electrical science has been more facilitated than by any since the days of Sir Humphrey Davy;) but he substitutes for the earthen or glass jars a wooden box, divided into compartments by watertight divisions, as represented in fig. 1 of the engravings on our front page. To avoid the danger which would attend a close proximity to the apparatus on bringing the positive and negative poles into communication, (supposing the wires to be immersed in gunpowder,) Mr. Roberts has contrived an addition to the apparatus, whereby the poles are connected by pulling a string, which may be of any required length, so as to enable the operator to station himself out of the reach of all danger.

A wooden upright A, about 9 inches long and 2 inches square, is fastened to each end of the frame, and a round wooden cross bar, B, an inch in diameter, connects the tops of these uprights (fig. 1.) A disc of tin, D, about 3 or 4 inches in diameter, and having a hole an inch in diameter in its centre, is soldered to the wire attached to the zinc plate of the first pair (the negative pole): this disc is fastened to the upright at this end of the battery, the round cross-bar passing through the central hole. As the disc is in metallic

connexion with the zinc plate it may be called the *negative pole*, and if a wire attached to the positive pole is brought into contact with the disc the battery is put into action. Another tin disc E, of similar size to that of the negative pole, must slide freely along the round cross-bar: the central aperture in this disc should be about an inch and a half in diameter, and to it a tin pipe, of the same diameter and about 2 inches in length, is fixed, (this is to be on one side only of the disc and must project towards the positive pole of the battery.) The use of the pipe is to keep the moveable disc steady during its motion along the bar: it must not project on both sides of the moveable disc, because it is necessary that the surfaces of the discs be in perfect contact with each other when the battery is in action.

Suppose then, a wire connected with the positive pole to be fastened to the moveable disc, and this disc to be then moved along the cross-bar until it comes in contact with the fixed disc, the battery is in action, because there is a metallic communication from one pole to the other. To enable an operator standing at a distance from the battery to bring these discs into contact, a string S, is fastened to the moveable disc and reeved through two holes bored in the fixed disc, and the two ends tied together about a foot behind the fixed disc, so as to form a span or double cord proceeding from the moveable disc. To this double cord is tied a string of any convenient length, which Mr. Roberts calls the *lanyard;* the end of this lanyard is carried to some place where the operator may be in safety, and on pulling it, the moveable disc slides along the cross-bar into close contact with the fixed disc, and the battery is thus put into action.

A further contrivance must however be provided to prevent the discs touching each other before the lanyard is pulled, and this Mr. R. effects by fastening to the pipe of the sliding disc a spiral wire, F, (such as a bell spring), which encircles the cross-bar, and has one end fixed to the wooden upright on the positive side of the battery. The length of the spring when unextended is such, that the moveable disc attached to it stands about 7 inches from the fixed disc, but when the lanyard is pulled, the spring extends, and the discs come in contact with each other, and if the lanyard be slackened, the spring separates the two discs, the action of the battery is stopped, and there is then no danger in approaching the charge of gunpowder, should it not have exploded when the electricity circulated through the fine wire.

To prevent the possibility of the discs touching each other before the workmen are prepared for the explosion, a wooden pin *p*, is placed between them; this is inserted into a hole bored through the cross-bar about midway between the discs. When all is prepared for firing the charge, this pin, which Mr. Roberts calls the *safety pin*, is removed from the hole before the lanyard is pulled.

We come now to the method of connecting the long-conducting wire with the battery.

In the practice of blasting, the conducting wire should be of copper, and about one-eighth of an inch in diameter; its length must of course vary according to circumstances; but, in general, if the battery be placed 20 or 30 yards from the rock to be blown up, it will be in perfect safety.

If the battery is to be 30 yards from the explosion, 60 yards of stout copper wire covered with cotton thread well waxed will be required. The 60 yards of wire are cut in half, and the two lengths of 30 yards each laid side by side, and bound together with twine nearly in the same manner as each wire is covered with cotton. As an additional security, this double wire may be done over with sealing-wax varnish. About a foot in length of the ends of these wires is left free, that is, not bound together in the manner the rest of their length has been. (See fig. 2.)

We have now a kind of rope 30 yards long, consisting of two wires bound together, and the four ends projecting. Take one end of this rope, and fasten its two projecting ends to the galvanic battery in the following manner: Solder one projecting end to the sliding tin disc, and the other projecting end (of the same extremity of the rope) to the wire attached to the positive pole of the battery. The wire rope must be *permanently* fixed in this manner; in fact, it thus forms a part of the battery. When not extended for use, it may be coiled up, or wound upon a reel. Let us now suppose the wire rope extended, two of its projecting ends fixed

to the battery, and let the other ends be connected by a few inches of fine wire; let us also suppose the plates immersed in the exciting liquid: if the *lanyard* be pulled, the *sliding disc* will move forward into contact with the *fixed disc* or negative pole, the electricity circulates from the positive pole through one part of the conducting wire, then through the fine wire (fusing it) back through the other part of the conducting wire to the sliding disc, and from this to the fixed disc, which is the negative pole of the battery.

The wire immersed in the gunpowder is generally of steel, and very *fine*, (of the sort called by watch-makers, *balance wire*) because the degree of heat raised in metals by electricity is in proportion to the minuteness of their diameter. A reel of this fine steel wire containing six or eight yards, costs 3*d.*, and will perhaps serve for a hundred explosions. A very short piece of it is employed at one time, because the obstruction to the progress of electricity through a conductor is in proportion to its length, and, if the fine wire be too long, it will prevent the passage of electricity in sufficient quantity to fuse it.

But as it would be inconvenient to have at every explosion the trouble of attaching a fine wire to the ends of the conducting wire, Mr. Roberts has contrived a *cartridge*, a number of which may be kept ready for use, and one fastened without loss of time to the *conducting wire* whenever required. The cartridge is a tin tube filled with gunpowder, and in this are placed the ends of two stout copper wires connected by a fine steel wire; the copper wires are each about 10 feet long, and serve to convey the electricity from the *conducting wire* of the battery to the fine wire immersed in the powder of the cartridge. These copper wires he calls *communicating wires*. The tube is stopped at both ends by corks covered with cement to keep the gunpowder dry; when thus corked and cemented the cartridge may be fired under water without a risk of failure. The *communicating wires* must be of sufficient length to extend from the bottom of the bore-hole in the rock to a few feet above the surface, and as the holes are seldom more than 6 or 8 feet deep, 10 feet may be taken as the average length of the communicating wires.

The details of making the cartridges are as follow :—

"Take 20 feet of stout copper wire covered with cotton thread, double it, and twist the two parts at the looped end closely together for about 6 inches of their length, A, fig. 3; then, with a file or cutting pliers, cut off the round end of the loop, and the ends will project as *horns* of half an inch in length B B; then bare the extreme points of these *horns* (being about half an inch asunder) of the cotton thread that is around them, and clean them with a file: now take half an inch of the fine steel wire, lay it across from horn to horn of the stout wire, and there (C) let it be firmly soldered. We have now two long stout copper wires connected at one extremity by a fine steel wire: the end of these wires are twisted together to prevent the horns slipping into contact with each other, and also to preserve the fine wire from being broken by any pull or jerk given to one of the communicating wires. As this combination of wires is placed in the bore-hole, it will be exposed to the action of the ignited charge of gunpowder, and, without some precaution to secure it, would be destroyed by every explosion: to prevent this waste, the communicating wire is first covered with cord (in the same manner as the conducting wire of the battery is covered), and an additional covering is then given of hard whip-cord or of fine binding-wire, (binding-wire will perhaps be found best, as it effectually prevents the included *communicating wires* being injured by the broken fragments of the rock). The fine wire soldered to the ends of the communicating wire will be destroyed at each discharge, for the electricity will fuse it, but this fine wire is easily replaced at a cost of three-halfpence for every dozen cartridges.

"The body of the cartridge is a tin tube, 3 inches long, and ¾ of an inch or an inch in diameter, of which the joint is soldered and rendered perfectly water-tight: the fine wire across the horns of the twisted wire is placed in the centre of the tube, and retained firmly in this position by a cork at the end of the tube, through which the twisted wires pass, fig. 4. The best way of fixing the twisted wires is to split a bit of cork half through, lay them in the slit, then force the cork into the tube, and this will jam the wires firmly in the slit: taking care that the horns do not touch the sides of the cartridge, and that the cork is covered with a good cement, as this assists in preserving the horns in their proper position. The cement I generally use is composed of one part of bees'-wax and two of resin, which, if put on hot, readily sets, is very strong, and does not crack in cooling;

but any cement that has these properties, and effectually keeps out damp, will answer the purpose. Having now the tin tube with the fine wire firmly fixed in the centre, the next operation is to fill the cartridge with gunpowder. It must be fine sporting powder and *thoroughly dry;* unless this be attended to, the fine wire may be fused by the electric fluid without igniting the charge, for the action is so rapid, that if the powder be damp, it will hardly be dried, much less ignited by the fusion of the wire. The best method of ensuring this dryness, when a great number of cartridges are made at one time, is to dry the powder over a steam-tight box filled with boiling water; but, when a few dozen only of cartridges are required, heat a soup plate by a fire, and when it is a little hotter than the hand can bear, take the plate from the fire, and throw into the plate a sufficient quantity of powder to fill two or three cartridges; shake it in the hot plate for two or three minutes, and then fill the cartridge tubes with the powder, which will now be perfectly dry and warm:—*while in this state* cork the ends of the cartridges, and cover the corks with the same kind of cement as that used for the corks through which the wire passes."

It only remains now to detail the actual process of blasting with the apparatus before described.

When a rock is to be rent by the explosive force of gunpowder, the first thing done is to bore in the rock a hole, of a depth and diameter proportioned to the strength of the stone and the quantity we wish detached. Let us, for example, suppose the hole to be 6 feet deep and 2 inches in diameter: cleanse it from dust and moisture by passing a straw or oakum wad several times through it, then lightly pour into the hole half the intended charge of gunpowder; put a cartridge upon this, and upon the cartridge pour the remainder of the charge; do not ram the powder down, for the lighter it lies together the better: the cartridge will thus be in the centre of the charge, and its long *communicating wires* will project 3 or 4 feet above the surface of the rock: the charge of powder and cartridge will fill about 8 or 10 inches of the hole.

The next operation is tamping. Thrust a straw or oakum wad gently down the bore-hole until it is about 2½ feet from the surface; this done, there remains an empty space (that is to say, containing merely atmospheric air,) of about 2½ feet in depth between the wad and the gunpowder. In practice Mr. Roberts has found it of great importance to allow this distance to exist between the powder and the wad, for the expansion of the air by the flame of the ignited powder adds to the rending force, and there is also an effect produced similar to that when a ball is rammed but half-way down a musket barrel. When the wad is in its proper place fill the hole up to the surface of the rock with dry sand. The hole is now charged, and about 4 feet of the cartridge communicating wires project above the surface of the rock.

Having filled the box of the battery with a saturated solution of sulphate of copper mixed with a little sulphuric acid, place it at some convenient distance from the rock, behind a large stone, or in any situation where it is not likely to receive injury from the falling fragments of the rock; put the frame of plates on the ground by the side of the box, and be careful the safety pin *p*, is in the hole prepared for it; then unroll the conducting wire, and attach the ends that are free to the cartridge communicating wires projecting above the surface of the rock. This attachment may be done by twisting them together, but it will be better that a binding-screw, fig. 5, be soldered to each free end of the *conducting wire*, and to these the *communicating wires* are readily attached by inserting an end into each screw, two or three turns of which will make the contact perfect. Fig. 5, represents the screw; *b*, hole for insertion of the communicating wire; *c*, the conducting wire soldered to the binding-screw, and *d*, the screw. This contrivance will be found of great service, because the cartridge can be attached to the conducting wire without loss of time, a good metallic contact between them is ensured, and, if the binding-screws are covered with cotton, varnish, or some other insulating substance, there will be no metallic contact between the separate parts of the conducting wire; and this should be avoided, because it would open a channel to divert the electric fluid from its proper course.

When the cartridge has been fastened to the conducting wire of the battery, unroll the lanyard, and carry the end to a situation where the operator can stand in perfect safety. Every one must now retire from the rock, except one person, whose office will be to ascertain that the

safety-pin is in its place, and that the discs do not touch each other; he is then to place the box in such a position, that its end shall be towards the point from which the lanyard is pulled, taking care this and the double cord are clear; he then puts the frame of plates into the box,—a pair of plates into each cell, being careful the fixed disc is towards the place where he stands to pull the lanyard: the safety-pin must now be taken out, and the operator retires to the place where the lanyard has already been laid; he then pulls the lanyard slowly and steadily, without a jerking motion; the moveable disc slides into contact with the fixed disc, the electricity circulates, and the charge of powder is exploded. Fig. 6 shows all the apparatus in proper order for firing.

In this figure *a a* are the communicating wires of cartridge.

c. Cartridge.
p. Powder.
w. Straw or oakum wad.
b b. Binding screw.
x x. Conducting wire.
l. Lanyard.
m. Man to pull the lanyard.
d. Battery.
s. Vacant space.
t. Tamping stuff.

The operator must after the explosion return to the battery, and remove the plates from the cells, coil up the lanyard, detach the conducting wire from the cartridge communicating wires, and coil it up. The communicating wires, most probably, will be found jammed between the fragments of the rock, and there they must remain until released by carrying away the stones, when the wires will be found uninjured:—if they are forcibly pulled out from the fragments of rock, they may be broken: the tin tube and fine wire of the cartridge will be destroyed by the force of the explosion, but the communicating wires will serve for another cartridge. It sometimes happens that, if the battery has not been used for some days, the papers that are round the zinc become so dry, that time is required for the exciting solution to penetrate through them to the zinc, and if an attempt be made to work the battery before the paper is well saturated with the liquid, it is probable no electricity will circulate: to avoid such a disappointment, either dip the frame of plates into a tub of water, for the space of five or ten minutes, or allow the plates to remain for a few minutes in the battery cells before the lanyard is pulled.

Mr. Roberts gives, also, a description of a method by which several charges may be fired simultaneously, which is stated to have been found of great service at Skerry Vore Lighthouse, now erecting under the superintendance of Mr. Allan Stevenson; but for this, as for many other illustrative details, we must once more refer to the pamphlet itself, which does altogether great credit to the scientific sagacity and practical skill of its author.

ADULTERATION OF ZINC.

Sir,—I beg to direct public notice, through your pages, to an important fraud in the market of metals, which I have recently discovered. Having had occasion for a considerable quantity of zinc, in as great a state of purity as I could readily obtain it, for the purposes of my patented method of preventing the corrosion of iron, I purchased and employed a quantity of waste clippings of sheet or patent zinc, obtained from a zinc-worker's establishment, and stated to consist principally of the best Belgian zinc. Circumstances occurred, during its use, to make me suspect this zinc contained some foreign metal; and on submitting to analysis several different specimens of the sheet zinc, just as received, I found them *all* to consist of variable mixtures of *lead and zinc*. The alloy of lead in some amounted to nearly one-fourth the amount of the zinc; in one specimen, to one-third; and in the greater number to between a sixth and a fifth of the weight of zinc. My curiosity having been excited, I have since examined several other specimens of sheet zinc, and find most of them alloyed with lead. This adulteration is obviously of the most mischievous tendency, as regards the chief purposes to which sheet zinc is applied, promoting its oxidation, and increasing its weight as a covering.

The end in view in the adulteration is, however, abundantly plain. Zinc is now about 49*l*. per ton, in sheets; lead is only 19*l*. per ton: hence, a metal consisting of three parts zinc, and one part lead—crude zinc being 37*l*. per ton—will

only cost 32*l.* 10*s.* per ton, and can be sold at 49*l.* per ton, so that there is a clear profit upon the adulteration of 5*l.* per ton; added to which, the base metal is *denser* than zinc, and hence *more weight* must be sold to cover the same surface.

The adulterated zinc might be at once recognized, by an experienced hand, by its superior flexibility to that which is pure.

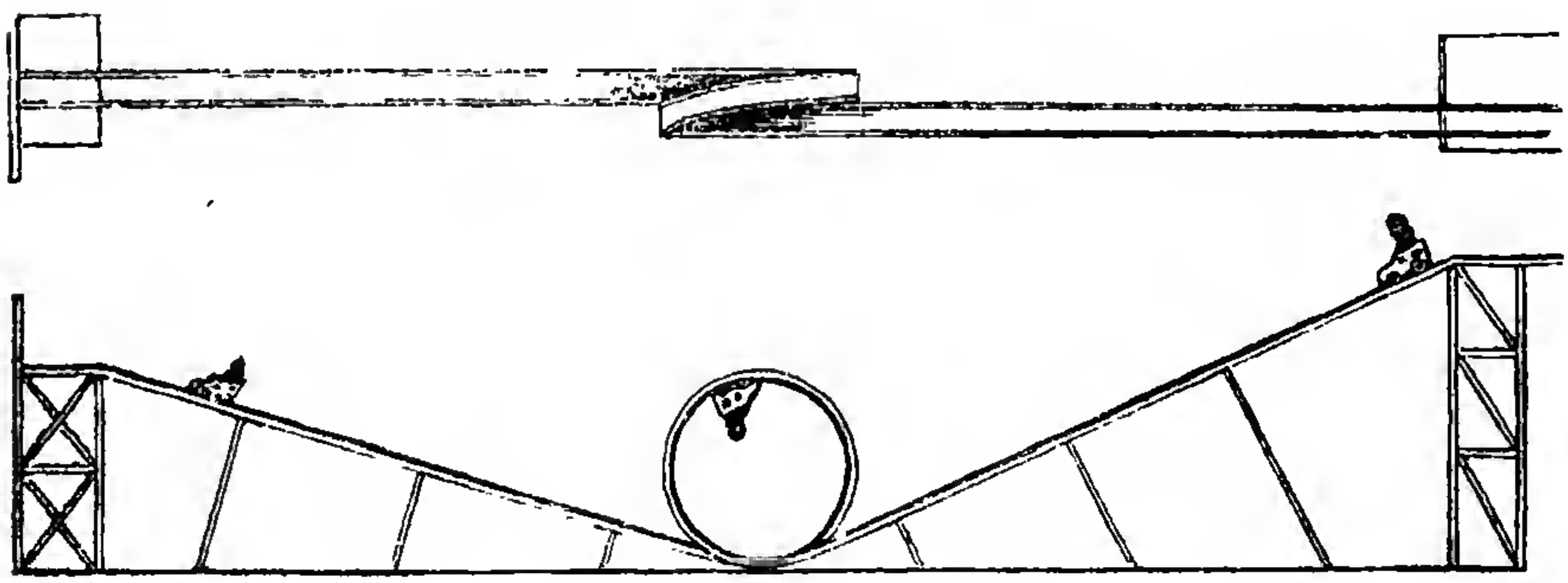
As such frauds are of public importance, and deserve exposure and reprehension, I have deemed this notice not unsuited to your journal, and am, Sir,

Your obedient servant,

ROBERT MALLET.

Dublin, April 24, 1842.

CENTRIFUGAL RAILWAY.



[From the *Liverpool Courier*, April 20.]

" Those who have visited the exhibition held some time since at the Mechanics' Institution, will probably recollect a small model railway in the room appropriated to illustrations of hydrostatics, in which a tiny iron carriage was made to run down an inclined plane, traverse an iron circle, and ascend an inclined plane on the opposite side. The curiosity attracted much attention, and those who did not fully comprehend the principle of its operation were not a little puzzled at the wonderful precision with which the little vehicle performed its rapid journey. If the miniature railway was deemed wonderful, we know not what the public will now think of that exhibiting at the theatre. We had the pleasure of viewing it in its full operation on Friday last. A carriage, sufficiently large to hold a man or a woman, is loaded with heavy weights, and despatched down a plane which reaches from the upper portion of the gallery down to the orchestra; here, by its own impulse, it traverses a vertical circle of 40 feet diameter, and the remaining force is expended in carrying it forward up another slope, which reaches to the back of the stage. The journey having been performed with fifty-six pound weights, a bucket of water, &c., without either of the weights or a drop of liquid having been displaced; a young man, and subsequently a young lady, entered the car, and each performed the apparently perilous journey in perfect safety, and without the slightest inconvenience. The exhibition is exceedingly curious, and well worthy the attention of the public."

The invention noticed in the preceding extract, is the same, we believe, which our readers will find included in our List of Registered Designs for the last month, No. 1196, April 14, Messrs. Hutchinson, Higgins and others, proprietors. The principle of the thing is well known, though the application of it to enabling people to travel with their heels uppermost is, doubtless, new. The prefixed engravings are copies on a reduced scale of those deposited at the Registration Office.

My Lord,—With the utmost respect I would address to you a few words on the subject of the meeting held in the Freemasons' Hall, on the 25th April, to consider the subject of a testimonial to the memory of the late Dr. Birkbeck.

My Lord, when one looks back at the many months during which the Committee laboured, (and laboured earnestly, and with good intention, no doubt,) to produce a scheme by which the memory of the late revered President of the London Mechanics' Institution might be preserved to his country, one cannot but feel vexed and angry at the worthlessness and nothingness of the result, and still more so at the countenance and support which it has received from your Lordship.

What is this result?—"Resolved, that the *most fitting* method of testifying the *public* gratitude to Dr. Birkbeck is by founding in *University College, London*, a professorship of machinery and manufactures, &c.!"

My Lord, the Committee of Lincoln's Inn-fields have, in this, and as far as they have gone, succeeded, most decidedly, in laying the first stone in the bad work of burying alive the name and fame of the lamented individual in question.

Let us take a full view of the new official personage thus about to be created—this professor of "machinery and manufactures." Let us look him full in the face, while we inquire into his pretensions. Firstly, what is he to teach? secondly, how is he to teach? and, thirdly, whom is he to teach? On the first point, it appears that the professor "is to teach the elements of machinery, and the application of these to the particular machines, the construction and operation of which he will exhibit and teach to his class," secondly, he is to teach by lecture; and, thirdly, he is to lecture to a class at the London University: and so the memory of the good Dr. Birkbeck is preserved! Further, the Committee inform us that by this scheme they are carrying out the spirit of the intentions of the worthy deceased, namely, the instruction of the working classes. My Lord, practical men well know that machinery and manufactures are not to be learned in the lecture-room, but only through the medium of a long and close apprenticeship in the workshop. The lecturer himself must go to the mechanic's workshop, and pick up, how he can, that knowledge which he is to give out to his class. My Lord, no greater mistake has ever found its way abroad than this meddling twaddle of teaching the working classes their own trades. In the course of your speech, my Lord, you gave the working classes a noble character for their unrivalled skill in their several trades, as well as for the gentle and uncomplaining spirit with which they bear the privations to which their station in society peculiarly subjects them. My Lord, you there did them justice. The artisans of England stand at the head of the world, as regards excellence in their several departments; and whether we view them in the various divisions of labour, of skill, of science, of continued industry, and indomitable perseverance, we must at least pronounce them so far perfect, as not to need the poor hour of the lecturer's prattle about "machinery and manufactures." But, my Lord, suppose this lecturer of "machinery and manufactures" had in his possession some secret which it would be worth the artisan's knowing—I say, suppose this to be the case, he being located in the London University—I ask, in the name of any thing sensible, how the artisan could avail himself of the good held out to him? The idea of artisans, working from six in the morning until eight o'clock at night, going to listen to a lecture by a "professor of machinery and manufactures," at the London University, is indeed the most unique piece of absurdity which could by possibility flit across the brain. As far, then, as the tendency of this Professor is to carry out the *spirit of the intentions of the late Dr. Birkbeck*, it must be perceived that those distinguished noblemen and gentlemen who have so handsomely come forward on this occasion have fallen into a very singular delusion.

My Lord, there are some mysterious allusions, not exactly understandable, printed in the circular issued by the Committee, to which I would draw your attention. In the third paragraph is the following:—"that while we were unable to devise means of affording direct advantage to the subscribers whom we hope to find in all parts of the kingdom,

so it was our duty to *avoid any application to merely local purposes of the proceeds of* so *general a contribution.*" I would ask, my Lord, is not the application of the funds to the creation of a professorship of machinery and manufactures, at *University College*, an application to *local purposes?* In the fourth paragraph is another singular allusion:—"It would bave been highly satisfactory to us, if we could have suggested some means whereby the fund which we hope to raise should be devoted immediately to the instruction of those classes of the people, whose intellectual and moral improvement Dr. Birkbeck has laboured to promote." Thus it ever is, my Lord—the old saying is here again verified—"the weakest goes to the wall," and is crushed; nothing could be *suggested* to serve or assist *them;* while, in the midst of this helplessness to "suggest" for the working classes, a lucky "suggestion" carried the day in favour of the students of University College!

Enough of this professorship: as a fitting testimonial to the memory of a man, who has deserved so well as Dr. Birbeck, the thing is an absurdity. What, my Lord, would have been said, if at the time of the death of the great Nelson, an individual had sprung up, and proposed to perpetuate his memory by the establishment of a professorship in one of the universities of Oxford or Cambridge, for the purpose of teaching the art of *yarn spinning?* Doubtless, my Lord, the man, would have been looked on as mad, and his scheme would have been at once scouted. The place his countrymen gave him was among her great and worthy names, which had been preserved to memory in the noblest form; and there, in his *marble* cabin, he still lives; while, before his shrine, the races of his countrymen, through all their generations, pass "lovingly and reverently," and then the Nile, and Trafalgar, and other recollections of his great services are recalled to memory, and thus from generation to generation is transmitted and secured the great Admiral's fame. So, my Lord, should be transmitted to future times the memory of those good services performed to his country, by Dr. Birkbeck. A statue erected to his memory in our Metropolitan Cathedral, would be the most appropriate, the most national, at the same time the most graceful and durable memento of his name; and further, the world would thus be informed, that among the virtues there enshrined, a new virtue, hitherto not much heeded, had been recognized in the person of him, the friend and teacher of the English artizan.

One more point, my Lord, yet remains to be noticed, and that is the contemptuous and disparaging tone with which Mr. Hodgkin's hint at a monument was received. A "bit of marble," forsooth, was the only term you could use on this occasion. My Lord, when a great name, when a great man chooses to be eccentric, then a whole host of inferior minds follow in his wake with wonderful unanimity. So it was with some of the movement spirits at the meeting. Lord John Russell talked of the "bit of marble," Mr. Roebuck, also talked of the "bit of marble." My Lord, when men of refined minds, in any age of the world, spoke of the art of the sculptor, it has never been in this poor and unworthy tone. The sculptors of antiquity were not accustomed to such language. It was not the custom for cultivated minds in the times of Canova, Flaxman, Chantry, and their brethren in genius to talk of the "bit of marble," when alluding to their productions. No; their "divine art," and their "immortal productions" were somewhat nearer the style in which their genius was spoken of, while the loftiest and best intellects have, in all ages, yielded reverential admiration to the genius of sculpture. The "bit of marble" sounded doubly odious coming from you, my Lord; it almost impresses one with the conviction that some great minds are denied the enjoyment of, and appreciation of, the beautiful. How different was the tone of another great man, Napoleon, when standing among the monuments of Egypt, he exclaimed to those by whom he was surrounded, "Forty centuries are now looking down upon us." My Lord, the "bit of marble" has brought down to us the deeds of antiquity. The "bit of marble" has perpetuated the manners of the far-off race of old Egypt. The "bit of marble" has recorded the graces of humanity of ancient Greece. The "bit of marble" has brought down to us the splendour and the heroism of ancient Rome, and the "bit

of marble" yet remains, in the opinion of the wisest and best of mankind, the most worthy medium for the commemoration of virtue.

By this "bit of marble" then, my Lord, I would preserve the memory of Dr. Birkbeck. That spirit of benignant goodness would be far more worthily and appropriately lodged in our Metropolitan Cathedral, than in the low rooms of the London University. His place should be among the great men of his country, and not in the cabined and cribbed dormitory of a professor of "Machinery and Manufactures." The fame of the good Doctor Birkbeck would be far better secured by the "bit of marble." The "bit of marble," my Lord, would speak to the heart of posterity, with far more point and effect than the husky tongue of the professor, and the divine art of the sculptor would give an immortality to his fame, as far transcending the paltry power of the "professor," as the sun's light exceeds that of the moon, or the cultured intellect that of the meanest savage.

I remain, my Lord, your Lordship's very humble servant,

HENRY BROWN.

Mile End.

MR. WILLIAMS'S FURNACE.—INTRODUCTION AT GLASGOW.

(From the *Glasgow Constitutional.*)

While it must be admitted that in a manufacturing city such as Glasgow, where hundreds of steam engines are daily at work, smoke, and that of a very dense character, has been looked upon hitherto as inseparable from the prosecution of manufactures; yet such is the progress of science, that we ought not to rest satisfied with our atmosphere of smoke while there remains the slightest prospect of obtaining the means of entirely removing or of abating the evil. Numerous plans have been proposed for the purpose of consuming or dissipating the smoke emitted from the furnaces of steam engines, but, at least in this city, none of them have so far succeeded as to produce any general diminution of the nuisance. Of late, public attention has been recalled to the subject by the exertions of Mr. Alston, of Rosemount, who is indefatigable in his pursuit of any object which he conceives to be calculated to promote public or individual benefit. In the course of his inquiries and researches on the most approved methods of removing the smoke nuisance. Mr. Alston became convinced that the plan of Mr. C. Williams, which had been to a considerable extent adopted in Manchester, was the best yet projected, and calculated to effect the object he had in view, almost to perfection. He accordingly used every means to circulate a knowledge of the merits of Mr. Williams's invention, and pressed, with an anxiety highly honourable to him as a public benefactor, on his friends who had steam engines, to try the experiment of adopting Mr. Williams's method. In this he has succeeded; and several proprietors have agreed to apply it to their furnaces. The first experiment was made on the engine furnace of Mr. Alexander Harvie, at Govanhaugh Printfield and Dyeworks. The furnace having been tried for a few days with complete success, Mr. Alston made a respectful application to the Dean of Guild, and the other members of the Dean of Guild Court, to visit the premises of Mr. Harvie, and judge for themselves of the invention and its results. This was handsomely assented to, and on Thursday last, James Black, Esq., the sub-Dean, and the other members present, accompanied Mr. Alston to Govanhaugh, where the whole apparatus and its effects were exhibited and explained.

Exteriorly, the furnace exhibits no difference from those of the ordinary form. It is in the interior of the structure chiefly where the means of preventing the formation of the smoke are accomplished. [Here follows a description of the furnace, with which the readers of the Mechanics' Magazine are already familiar.]

When the Dean of Guild and the other gentlemen arrived at the works, Mr. Harvie directed fuel to be put upon the fire, and, excluding the air from the air chamber, he showed the usual quantity of smoke issuing from the stalk. By an ingenious application of glazed apertures at each end of the boiler the state of the flues could be distinctly seen, while immediately over the door of the orifice leading to the diffusion box, another glazed aperture affords a view of the cast-iron plate, and the effects of the first contact of the air with the smoke from the furnace. While the smoke continued to pour in volumes from the stalk, Mr. Harvie opened the door or valve of the air-ports, and in about a minute—in fact as soon as the smoke at that moment in the flues and stalks could escape—not a particle of *visible* smoke was emitted! During the time the door was shut the flues were seen filled with smoke; but immediately on its being opened and air admitted the flues were filled with flame. These alternate shuttings and openings were several times repeated *with the same fire*, and the result was invariably the same—with

the air chamber door shut there was the ordinary smoke emitted, with the door open there was none whatever!

The Sub-Dean and the other members of the Dean of Guild Court expressed the highest satisfaction at the results, and declared their perfect conviction of the invention being completely successful in accomplishing the intended object.

We understand that, now when a certainty exists that at a trifling cost the smoke nuisance may be completely removed, the Procurator Fiscal of the Dean of Guild Court is determined to bring several of the manufacturers, &c. having engines in the city, before that Court, under the act of Parliament, to decide the point whether such parties can be forced to obviate the smoke of their furnaces in the most effectual way.

CAPTAIN CARPENTER'S PROPELLERS APPLIED TO CANAL NAVIGATION.

We noticed in a recent Number the performance of Captain Carpenter's stern propellers, and of the disc engine, as fitted to the pinnace of the steam-frigate "Geyser," when tried on the river. We learn that, subsequently to these trials, experiments have been made with this boat on the Grand Junction Canal, in the presence of Sir F. Head, and other leading Directors of the Canal Company, and some partners of the eminent carrying firm of Messrs. Pickford and Co.

Notwithstanding the unfitness of Captain Carpenter's boat for canal navigation, arising from her great breadth of beam, the results obtained during these experiments were such as to induce the gentlemen present to express their unanimous opinion, that the important problem of the adaptation of steam power to canal navigation had at length been completely solved.

We are, further, much pleased to learn that the Committee of the Grand Junction Canal Company have voted a sum of 100*l.*, to be tendered to Captain Carpenter, on behalf of the Company, to mark the sense which they entertain of the important service which he has rendered to the canal interest by his invention.

We may now, therefore, hope soon to see steam-power as triumphant on our canals as our rivers; for the objection of injury to the banks from the action of paddle-wheels being once removed, (by the adoption of stern propellers,) the rest is easy. The proprietors of the disc engine are making active exertions to take the lead in this new field of enterprize, and, from all we can learn, with good prospects of success.

PILBROW'S CONDENSING CYLINDER ENGINE.

Sir,—I have been prevented sooner offering my thanks to your valuable correspondent "S," for his good wishes, and for his communication upon my engine (in No. 971) which I have read with satisfaction; because, though he does not take quite so favourable a view of it as I could wish, yet it appears free from prejudice, and his facts, as there given, are but proofs of the correctness of my own views. The drawing he mentions, I presume he perceived was meant merely to illustrate the *principle*, not to *work* from; therefore it was made as compact and as neat as the circumstances permitted, and occasion required.

I feel also obliged to your correspondent "Throttle-valve" for his "suggestions" (in No. 972,) though I think he misapprehends the grand object which I endeavour to obtain by my invention, and incline to think he cannot have seen the pamphlet written upon it, as an arrangement is there made for "passing the centre with *one* engine."

I am, Sir,

Very respectfully yours,

JAMES PILBROW.

Tottenham Green, April 18, 1842.

PATENT LAW CASES.

Vice-Chancellor of England's Court, Lincoln's Inn.

April 21, 1842.

Hancock v. *Hullmandell.*

[In January, 1838, Mr. Charles Hancock, the eminent animal painter, obtained a patent for "certain improved means of producing figured surfaces sunk and in relief, and of printing therefrom, and also of moulding, stamping, and embossing." The defendant, Mr. Hullmandell, also obtained a patent in November, 1841, for "a new effect of light and shadow, imitating a brush or stump drawing, or both combined, produced on paper, being an impression from a plate or stone prepared in a particular manner for that purpose, as also the mode of preparing the said plate or stone for that object." Mr. Hullmandell's "new effect"

is alleged by Mr. Hancock to be obtained by means which are included in his specification; and the present was a motion for an injunction to restrain the alleged infringement.

Mr. Stuart and *Mr. Elderton* were for the plaintiff; *Mr. Girdlestone* and *Mr. Rotch* for the defendant.

The part of his specification on which the plaintiff relies, is the following: "I take a thin solution of caoutchouc mixed with etching ground, or any other composition which will resist the action of acids, and with it cover the whole surface of the plate, and then with an etching point, or other suitable instrument, remove all the parts which are not intended to be in relief, (or with the same or any suitable composition, draw or paint upon plain, curved, or undulated metallic surfaces, the whole of that part of my design which I intend to be in relief,) and when the drawing is perfectly dry, I place it in a dish or trough of adequate dimensions, with its face downwards, immersed to a proper and uniform depth in the acid liquor, which I allow to operate until the desired effect is obtained. Should any part require to be placed in higher relief, the plate, block, or cylinder, is to be washed clean with spirits of turpentine, and a ground laid on in the manner usually practised in relaying of grounds; it is then to be submitted again to the action of the acid, or the part lowered with the graver."

The degree of similarity between the preceding process and that followed by the defendant, will be seen by reference to the *Mech. Mag.* vol. xxxiv. p. 207, where a very full abstract is given of his specification.

Numerous affidavits from artists and men of science, were produced on both sides; but there was a great conflict of testimony as to the novelty of the inventions, and whether one was an infringement of the other.

At the conclusion of the arguments of *Mr. Stuart* and *Mr. Elderton* on behalf of the plaintiff,

The *Vice-Chancellor* said, when the Court found persons of such scientific knowledge in these matters giving the opinions they had, he was quite unwilling to take upon himself to say what they had stated was groundless, which he should do to a certain extent by granting the injunction in the present state of things. Therefore, in the extraordinarily dark state of the case as it was now presented to the Court, he thought the proper course would be to do nothing on the motion, but to let it stand over for the plaintiff to bring such action as he should be advised, to try the validity of his patent.

Mr. Girdlestone, with *Mr. Rotch*, however, insisted that upon the conduct of the parties since the granting of the patent of Hullmandell, as well as the ground that two legal titles were brought before the Court, one of which must be taken, *prima facie*, to be as good as the other upon a motion for an injunction, the application ought to be dismissed altogether. The learned counsel also went into a lengthened argument upon the principles of the two patents, in the course of which illustrations were given by the execution of impressions of the engravings in open court, his Honour observing, that in the whole course of his experience he never remembered such a peculiar kind of "drawing in equity." (A laugh.)

The *Vice Chancellor*, in giving judgment, said he considered the case a very important one, and for that reason he should follow the course he had already suggested. He wished to have it made absolutely certain whether there had been an infringement of the patent or not. If he were to act on the present impression in his mind, it might happen that when the case came before a jury, a verdict might be pronounced against that opinion, and then he should have on a matter of fact, and not being at all conversant with the subject, an opinion he had pronounced on the verity of the case contradicted by persons who were, by the law of the country, the constituted judges of disputed matters of fact. He therefore adhered to the opinion he had expressed, that all he could do was to let the motion stand over for the plaintiff to bring an action, or otherwise to take such proceedings as he might be advised, with liberty to either party to apply.

April 26.

Russel v. *Ledsam.*

[For the better understanding of this case, we prefix a few explanatory particulars. Mr. Russel, the plaintiff, is the well known gas tube manufacturer of Wednesbury, who, besides being himself the inventor of a method of making tubes, for which he had a patent long since expired, is assignee of a patent for improvements in this branch of manufacture, granted to Cornelius Whitehouse in 1825, and renewed on its expiration, for a term of seven years. Mr. Ledsam, the defendant, has been recently manufacturing tubes under the patent of Mr. Richard Prosser, of which we gave an account in vol. xxxiii. p. 386, and it is the validity of this patent which is the present subject of dispute. Mr. Russel alleges it to be an infringement of Whitehouse's. In our account of Mr. Prosser's invention we referred to a patent still older than either Prosser's or Whitehouse's, namely, that

granted to Henry Osborne in 1817. Osborne used a pair of grooved rollers, similar to the rollers employed in rolling round iron. The invention of Osborne has been employed chiefly in welding gun-barrels from plates of iron called skelps, and is now in common use by the gun-makers of Birmingham. About 1820 Osborne commenced the manufacture of gas tubes by means of his invention, and the tubes so made were used for lighting his workshops. He also made gas tubes for Mr. Clegg, the earliest, and still the most eminent of our practical gas engineers. The tubes were made in lengths of about 4 feet each, and had to be passed between the rollers many times before they were completely rounded. The welding was done on a mandril, and the latter rollings without a mandril, for the purpose of rounding the tube by repeated rollings as is done in rolling round bar iron. In 1824 Mr. Russel took out his patent for welding tubes, and proposed the use of a tilt hammer, and also grooved rollers; he says the welding may be done either with or without a mandril. In 1825 Whitehouse took out his patent for the same purpose, which (as before stated) was afterwards assigned to Mr. Russel. The invention of Whitehouse consists in drawing the tube at a welding heat through a pair of dies or holes, the dies or holes gradually decreasing in size, and the pipe or tube being re-heated after each drawing operation; only one half of the tube is heated at a time, and after that half has been reduced to the required diameter, and drawn to the requisite length, the other half of the tube is heated, and drawn through a pair of dies; it is then re-heated and drawn through another pair of dies, a little smaller; after which it is once more re-heated and re-drawn through another pair of dies a little smaller than the preceding; the tube, after six operations (three at each end) is finished so far as concerns the welding, and a skelp of 5 feet 6 inches long becomes by these operations 8 feet long. The main bench moves at the rate of 1 foot per second, so that to weld a pipe 10 feet long would occupy at least forty seconds of time. Now the peculiarity of Mr. Prosser's invention consists in this, that a pipe is perfectly welded by one operation of the machine, and whatever may be the diameter of the pipe, a length of 10 feet is welded in *two seconds*.

The judgment of his Honour, the Vice Chancellor of England, will be found to state very clearly the difference between the two inventions, and the decided improvement which the defendant has effected.]

The *Vice Chancellor*. With regard to the merits of this case, in the first place it appears to me to be an extremely interesting case, and interesting from this circumstance particularly, because it seems to me to be quite established that the thing which in substance Mr. Whitehouse claimed as the principle of his invention was new; namely, the causing to pass by some means or other the imperfectly formed iron tube, when it was nearly in a state of fusion, through a cylindrical ring which would give such a pressure on the softened metal as would cause the parts to weld, and in that sense to form a perfect tube. I observe, however, there are differences brought forward with respect to the mode which the defendants adopt. The plaintiff himself was utterly indifferent to the mode by means of which the almost fluid metal should be caused to pass through the cylindrical ring —through what he calls in one place, swages, or dies, and in another place, dies or holes. He was utterly indifferent to the mode by which that propulsion should be created.

Now, as I understand it, the defendants have invented this plan. By means of four pulleys, which are grooved, or things in the shape of pulleys which are grooved, the defendants contrive to give a propulsive motion to the heated tube as it passes through the grooves, which grooves collectively make together a ring or cylindrical ring, which has the effect of compressing the tube in every part, and causing the operation of welding, but which at the same time has the effect of by itself causing the tube to move forward, and therefore gets rid altogether of that machinery of the draw-bench and the pincers and so on, which is described at considerable length in Mr. Whitehouse's specification.

You see the substantial difference between the two things is, that according to the specification of Mr. Whitehouse, the die or the hole is fixed, it is motionless, and it is motionless in this sense, that it not merely stands still, but it *communicates* no motion; whereas, as I understand it, the pulleys which are used by the defendants, though they themselves are fixed in this sense, namely, that their centres do not move, yet their circumferences are moving, and the motion of their circumferences in a fixed plane, they being at right angles to each other, has the effect of giving a motion to the tube as it passes through their edges. Now that, certainly, is a very important difference between the two, although I am not going now to pronounce on the question whether the thing is identically the same. It seems to me, however, that there is a very substantial difference in that respect between the two.

Well then, it is observed that the plaintiff's patent, that is to say, Mr. White-

house's patent, has in its specification this direction, that after the tube has been moved to a certain extent, the pincers are to be taken off, the thing itself is to be reversed in position, and that which before was not exposed to the action of the fire, is to be put into the furnace, and nearly fused, and then to go through the same operation as its first half had previously gone through.

Now it is very remarkable that in this specification of Mr. Whitehouse, it is said, and said in praise of the thing, "That the length of the pieces of tube thus made, is likewise a great advantage, as by these means they may be made from 2 to 8 feet long in one piece, whereas by the old modes the lengths of tubes cannot exceed 4 feet without considerable difficulty, and consequently an increased expense," whereas it is reasonably plain, upon the statement of the machinery used by the defendants, that so far from stinting the tubes to the length of 4 feet, or 8 feet, they may be made to any length to which the tube may be propelled, and there is no limit to it, as I understand. Now there was, and I have no doubt that what this specification says is true, there was a very great advantage derived by the power given by Mr. Whitehouse's patent of making the tubes even to the limited extent, and what seems to have been considered the utmost extent of 8 feet.

Mr. Richards (for the plaintiff.) They cannot make them so long as we can.

Mr. Bethell (for the defendant.) Oh yes we can, and longer.

The *Vice Chancellor*. That I do not know any thing about.

Mr. Bethell. Will you give us an order for some 12 feet long?

The *Vice Chancellor*. I am speaking of the thing only theoretically. There is no physical limit to the extent to which the tube may be made by the defendants' process by one uniform operation. Well, now, those things do appear to me to be things that ought very much to be considered, when the question is raised whether there has been an infringement of the plaintiff's patent or not; and though I can easily understand that when the thing was in a ruder state at the time when Cowley's case came forward,* and that it might very well do then to hold there was an infringement of the patent, yet I cannot but myself think there is a fair question here to send to a jury. I cannot but think, on the whole, there is quite enough to constitute a fitness for sending the case to a jury. And one thing which occurred to me was this, that if it be true that there is a very great improvement by means of the machinery under which the defendants are acting, why, if I were to grant an injunction in the first instance, I might be depriving the public for a time of the benefit of that very improvement. Now I should be extremely unwilling to do that, unless I felt the case was irresistibly clear, and therefore I rather think the safest and the best course, and therefore the course I ought to pursue, is to direct there shall be an action brought by the plaintiff, in such manner as he may be advised, against the defendant, for the purpose of determining this question; and I shall direct it in the usual terms, that both parties may be at liberty to apply. If it were desired by the plaintiff that he should have an inspection of the defendants' works, I do not understand the defendants themselves to refuse it.

Mr. Bethell. We have been always ready and willing.

The *Vice Chancellor*. I think so, and therefore it struck me it might be possible for the plaintiff to get in without an order. The witnesses of the plaintiff should have an opportunity of stating to the jury what is the actual state of the defendant's machinery, in order that their testimony may be contrasted with that which may be given on behalf of the defendants, and in order also that they may be enabled to state what is the difference, if any, between the machinery as now constituted, and the machinery as it was in the month of July or August last. What I incline to do is this, to give a direction that the defendants shall, at reasonable times, permit an inspection of their machinery by agents of the plaintiff, the plaintiff giving reasonable notice; and I would give liberty to apply, meaning thereby, of course, that if it became necessary, after an inspection, to require the defendants to make an affidavit, then I would direct the defendants should make an affidavit, rather than direct them in the first instance to make it, because it appears to me I must presume, and I have a right to presume the defendants will act fairly.

Mr. Richards. That is amply sufficient.

The *Vice Chancellor*. The order is, that the motion at present stands over; the plaintiff undertaking to bring such action as he may be advised, and the defendants being directed to permit the plaintiff's agents, at reasonable times, and with reasonable notice, to have an inspection of the defendant's machinery, with liberty to apply. It appears to me that that will be the order necessary for the real and fair trial of this great question.

Mr. Rotch. A like inspection, of course, by the defendants, of the plaintiff's machinery.

Mr. Richards. Certainly.

The *Vice Chancellor*. Of course.

* Russel v. Cowley, 1. Cr. M. and R. 864.

NOTES AND NOTICES.

Photo-lithography.—An artist at Rome, named Rondoni, has just succeeded in taking photographic drawings on stone, and printing from it. In that way he printed a lithograph of a nebula of Orion! This is printing at second hand from nature herself: bringing the firmament within one move of the press. The next process will be to print speech and music warm from the lips.—*Spectator.*—The most curious part of the whole affair our esteemed contemporary has omitted to state. The reflected image of the nebula of Orion exhibited the exact likeness of a whale! "Very like a whale!"

The Precursor—the name given to the first of a line of large steam-vessels about to be established between Calcutta and Suez—which arrived recently in the River, from the Clyde, accomplished the voyage in the remarkably short space of 70 hours, being at the average rate of 11½ geographical miles per hour. She is of 1,751 tons, and 500 horses power. The engines, which are of the common side lever construction, have been constructed by Mr. Robert Napier, of Glasgow.

Steam Navigation of the Danube and Black Sea.—In 1830, a company for the promotion of steam navigation on these waters was chartered by the Emperor of Austria. In 1831, the first boat, the "Francis I.," was launched. In 1840, they had 10 river boats and 10 sea boats in operation, and 5 more on the stocks. These boats now make regular passages, during the navigation season, between Lintz, Vienna, Pest, Semlin, Galatz, Varna, Constantinople, Trebizond, Salonica, and Smyrna. The passage from Vienna to Constantinople is accomplished in 17 days. All the boats are built after English models. Two of them, the "Sophia" and "Stephan," are of iron. The fuel used is coal, from the vicinity of Pilsen, in Bohemia.

The Maine and Danube Canal, which now approaches its completion, is 108 miles in length, and connects the Danube, near Ratisbon, with the Maine, at Bamberg. When it is opened, an uninterrupted communication by water will exist between the North Sea, or German Ocean, and the Black Sea—one of the most magnificent lines of internal communication in the world.

New Quicksilver Mines.—A correspondent writes from Florence, that the mine of quicksilver discovered last year in the environs of Peravezza, near Pisa, is in full work, and during the last month yielded more than 6,000 lbs.—a produce that is daily increasing. The Grand Duke had visited them, and expressed his satisfaction at the able manner in which they had been conducted, announcing the intended appointment of a commission of French, English, Italian, and German geologists and chemists, to search for the other mines of quicksilver, which, according to tradition, exist in the Grand Duchy.—*Morning-Chronicle.*

Cornish Steam-engines.—The number of pumping-engines reported for March last is forty-eight. They have consumed 4,163 tons of coal, and lifted 34,000,000 tons of water 10 fathoms high. The average duty of the whole is, therefore, 56,000,000 lbs. lifted one foot high by the consumption of a bushel of coal.

Duration of Malleable Iron Rails.—Time was when engineers generally were under the impression that rolled iron edge rails, of 50lbs. to the yard, would last from 40 to 60 years, but experience is fast dissipating all such notions, by demonstrating that the duration of rails of malleable iron is not determined by mere superficial wear, but by the time which it requires for a given amount of trade rolling upon them, to disintegrate them internally—that is, to produce disruption and exfoliation of the laminæ of which they are composed. Mr. Ellwood Morris, an American engineer, calculates (*Franklin Journal* for March) that 1,500,000 tons gross weight, conveyed over rolled iron edge rails of the T and H forms, weighing from 33 to 42lbs. per yard, will destroy them in 10 years. The rails of the Philadelphia and Columbia railroad, which are of this description, have been in use only 7 years, and are already exhibiting strong symptoms of coming destruction. Mr. Morris has the candour, at the same time, to mention that these results are in perfect accordance with what our countryman, Mr. W. Chapman, of Newcastle, (see *Wood on Railroads,*) predicted, many years ago, as most likely to happen.

The "Mountains High" of Marine Scene Painters.—Some writers have asserted that the height of the waves of the ocean, from the trough to the crest, reaches often to 40 and 50 feet. But Dr. Arnott, in his Elements of Physics, affirms that "no wave rises more than 10 feet above the ordinary sea level, which, with the 10 feet that its surface afterwards descends below this, gives twenty feet for the whole height, from the bottom of any water valley to the adjoining summit." From observations subsequently made with great care in the midst of the Pacific Ocean, by the French Exploratory Expedition, it appears that Dr. Arnott was very nearly right. The maximum height of waves was then found to be 22 feet.

Dutch Wagons.—The Rev. W. L. Rham, in a paper on the Agriculture of the Netherlands, read before the Royal Agricultural Society of England, describes the Dutch wagons as light in weight, with a very narrow track to accommodate them to the narrow roads on the tops of the dykes. As a pole would be a great incumbrance in the act of turning round within a very narrow space, a curious substitute has been adopted, viz., a very short crooked pole, which rises in front, and is moved by the driver with his foot, as he wishes to direct the course of the wagon to the one side or the other: a person unaccustomed to the use of this contrivance, would never be able to drive a Dutch wagon, which requires great judgment to steer it, while a drunken driver would be discovered a long way off by the oscillations of his wagon, which frequently runs off the dyke, and is overturned into the ditch on one side or the other, the horses having no power to keep it straight when the crooked pole has not a steady foot to guide the front wheels. The Dutchmen always make their horses trot in the wagon when not heavily loaded; by which much time is saved in haymaking and harvest, and the horses being accustomed to it, naturally trot like carriage-horses, when the load and roads permit.

Fall of a Meteoric Stone at Grunenberg, in Silesia.—On the 22nd of March, 1841, at 3½ p. m., the inhabitants of Heinrichau, who were abroad in the fields, heard three heavy reports like thunder-claps in the air, and soon after a whizzing noise, which ended in a sound like that of a heavy body falling to the ground. The sky at the time was almost wholly clear. Some persons went in the direction from which the sound came, and, after proceeding about one hundred and fifty paces, found a fresh hole in the earth, at the bottom of which, about half a foot below the surface, they found the stone which had just fallen. The stone, (which is of the form of a four-sided pyramid,) is evidently a fragment of a larger one which burst in the air; three of its sides are broken, the fourth is covered by the thin black crust peculiar to meteorites. It weighs two pounds four ounces.—*Poggendorff's Annalen.*

The Steam-bark "Clarion," fitted with Ericsson's propellers, was totally wrecked on the 19th of March, on the island of Cuba.

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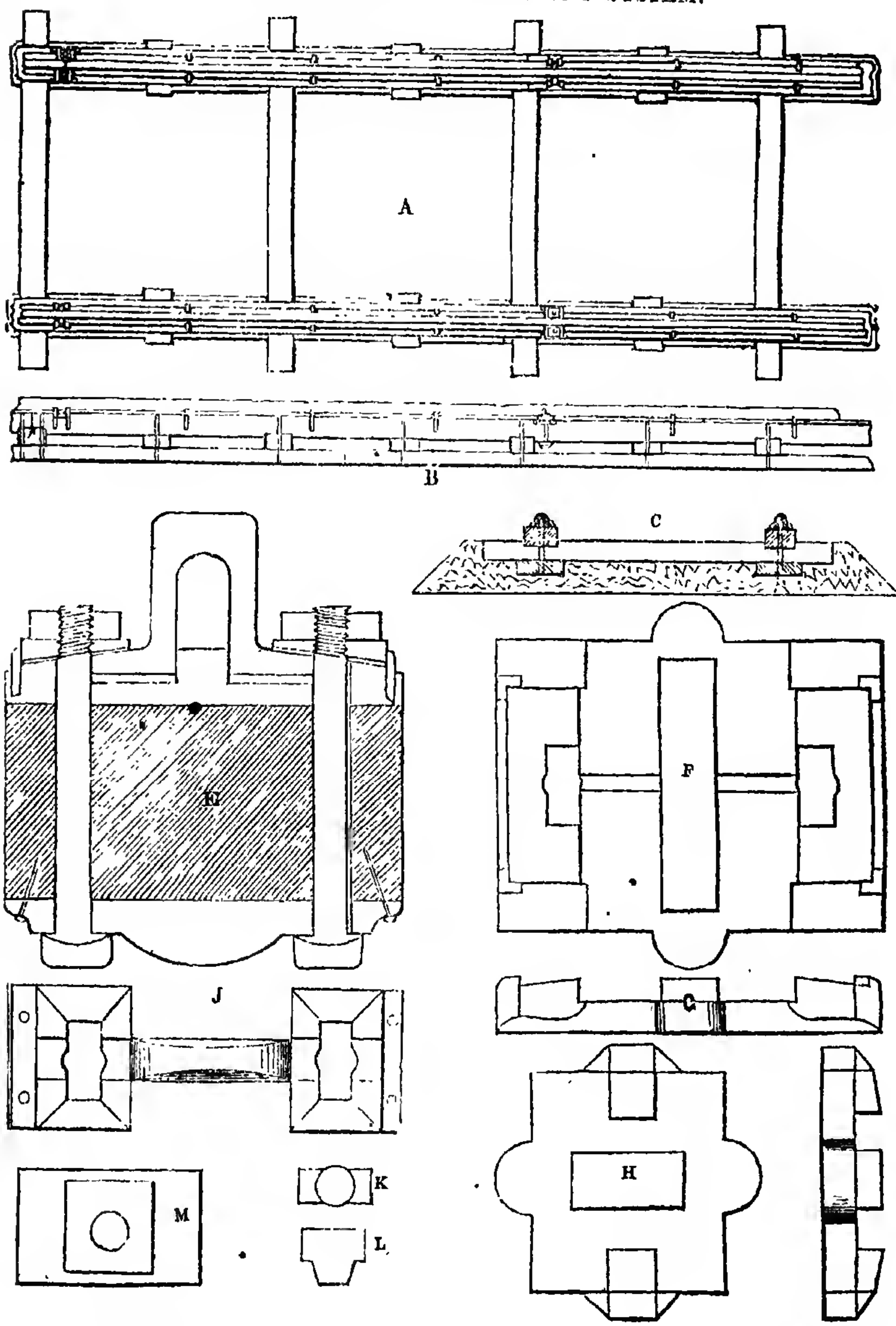
LATROBE'S IMPROVED RAILWAY SYSTEM.



DESCRIPTION OF AN IMPROVED PLAN OF RAILWAY SUPERSTRUCTURE ADOPTED ON THE BALTIMORE AND OHIO RAILWAY. BY BENJAMIN H. LATROBE, ESQ., C. E. WITH REMARKS BY ELLWOOD MORRIS, ESQ., C. E.

(From the *Franklin Journal* for March, 1842.)

The rail is of rolled iron, imported from England; it is of the bridge, trough, or inverted U section,* $3\frac{5}{8}$ inches in height, $4\frac{7}{8}$ inches in width at the base, and $2\frac{1}{8}$ inches from out to out of the sides of the upright stems; the bars are in lengths of 20 feet, with their ends cut square, and weigh 340 pounds each, or 51 lbs. per lineal yard.

The rolled iron rail is supported throughout its length, by a *continuous bearing* of sawed timber, $4\frac{1}{2}$ by 8 inches in section, and in lengths of 20 feet, like the *rail-bars* and *sub-sills.*

The *continuous bearing* reposes flatwise upon *cross-ties* and *bearing-blocks*, the *cross-ties* being $4\frac{1}{2}$ by 6 inches in section, laid flatwise upon the *sub-sills*, and notched on the top $1\frac{1}{2}$ inch deep and 8 inches wide, to receive the *continuous bearing;* this notch being cut $\frac{5}{8}$ths of an inch deeper on the side next the centre of the track, so that the *continuous bearings* when laid on both sides, mutually decline towards each other at the rate of $\frac{5}{8}$ths of an inch in 8 inches, or 1 in 13, thus bringing the top of the iron rail also, into a plane of this inclination, which is the same as that of the cones of the wheels now used upon the Baltimore and Ohio Railroad.

The *bearing blocks* are 3 by 6 inches in section, and 1 foot in length, they are laid crosswise to the track upon their flat sides, and support the *continuous bearing* at points intermediate to the ties, without any notching.

The *cross-ties* are laid 5 feet apart between their centres, as are the *bearing blocks*, and hence, the *continuous bearing* is supported at points $2\frac{1}{2}$ feet asunder, if we measure from centre to centre of the supports, or has unsupported spaces, of but 2 feet lineal in the clear between the sides.

The *cross-ties* and *bearing-blocks* rest upon *sub-sills*, 3 by 10 inches in section, and also in lengths of 20 feet; at every point of support, the *continuous bearings*, the *cross-ties* or *bearing blocks*, and the *sub-sills*, are pinned together by *tree-nails* $1\frac{1}{4}$ inch in diameter, and going quite through the three timbers; but where the joinings of the *continuous bearing* occur above a *tie*, two *tree-nails* of an inch in diameter (one in each of the meeting ends of the *continuous bearing*) are used.

The joinings of the *rail-bars* upon the opposite sides of the track, break joint with each other midway of their lengths; they also break joint at the same time with the *continuous bearings* upon which they rest, and these in like manner break joint with the *sub-sills;* every joint of two adjacent timbers of the *continuous bearings*, is made to fall upon a *cross-tie*, and all the joinings in the track are merely square butt joints, no scarfs being used; by this system of distributing the weak and strong points, the strength of the track is equalized.

A cast iron *joint chair*, weighing $7\frac{3}{4}$ lbs. is placed under the ends of every two adjacent *rail-bars*, and a *centre chair*, also of cast iron, weighing 4 lbs. under the middle of each rail.

The *joint chairs*, together with the *rail-bars*, are fastened down on the *continuous bearing* by two vertical *screw-bolts*, (one on each side of the chair) going through oblong mortise holes made in the timber, and also, through similar apertures in cast iron *bearing-plates*, fastened up against the bottom of the *continuous bearing*, in the interval between two supports, but close to one: the *screw-bolt* is formed with an oblong square head, fitting the mortise hole in one direction only, so that by making a half turn with it after its head has descended below the *bearing plate* just mentioned, it laps over the sides of the oblong hole in that plate, and falling into a recess cast for the purpose, when drawn up by the nut, the *bearing plate* is thus made to grasp the *continuous bearing* firmly: whilst the nut being screwed down upon a wrought iron washer and zinc plate, (designed to protect the iron by galvanic action) which lap upon the projecting base, or feet of the contiguous bars of the U rail, they are thus secured to the joint chair, and the latter to the *continuous bearing.*

The *centre chair*, and the middles of the *rails-bars*, are held down on the *continuous bearing* by four *brad-headed spikes*, (each $4\frac{1}{2}$ inches long and $\frac{7}{16}$ square in the shank;) and the iron rail between the *joint* and *centre chairs* is held by twelve similar spikes driven in pairs, (one on each side) at intervals of $2\frac{1}{2}$ feet.

The *chairs* are let their own thickness

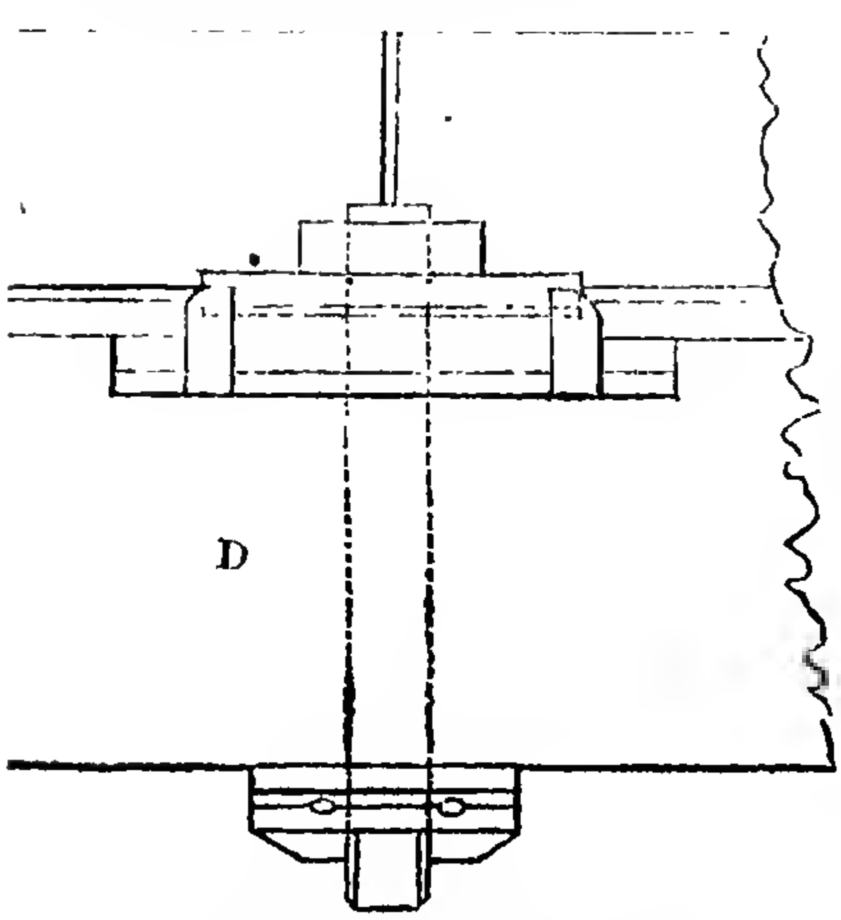
* This pattern of rail, which in section very much resembles the letter U inverted, and hence, in technical phraseology, ought perhaps to be called the U rail, was invented by S. V. Merrick, Esq., of Philadelphia, in 1831, and by him denominated the *Trough Rail* from its resemblance, when inverted, to a trough. (See the *Franklin Journal* for August, 1835.) It has been used upon the Wilmington and Susquehanna Railroad, and the Great Western Railway in England, and continues to give very satisfactory results.—ED.

(⅜ths of an inch) into the *continuous bearing*, so that their tops are flush with the upper surface of the latter, and the bottom of the rail bears fairly upon both.

The *chairs* have each a projection going up vertically into the hollow of the rail, and two horizontal semi-circular projections on their ends to fit into half round mortises in the wood, to prevent lateral motion.

The *centre chairs*, moreover, have two square projections on the upper surface, which fit notches of the same dimensions (⅜ths of an inch square) in the feet of the rail, to confine the bars from longitudinal movement.

The whole of the track is laid upon, and partly imbedded into, a *ballasting* of broken stone, composing a mass of open material—entirely pervious to water—10 feet wide at bottom, 8 feet at top, and 1 foot in depth: the lower part consisting of stone broken to pass every way through a 2 inch ring, and the upper part of such as will in like manner pass a 4 inch ring: the base of the *ballasting* is about 1½ inches below the bottom of the *sub-sill*, and its top, level with the upper surfaces of the *cross-ties*, or 3 inches below the top of the *continuous bearing*. The distance between the iron rails, or the *gauge of the railway*, is 4 feet 8½ inches.



References to the Engravings.

A, general plan of the superstructure; B, side view of ditto; C, transverse section ditto; D, side view at the joint of the rail, showing the rail and its fastenings to the contiguous bearing; E, cross section through the continuous bearing at the joint of a rail; F, plan of the joint chair; G, end view of ditto; H, plan of the centre chair; I, end view of ditto; J, plan of the bearing plate; K, plan of the screw bolt; L, cross section through the rib of the bearing plate; M, plan of the nut and washer.

Scale of A, B, and C, ¼th of an inch to the foot, the remainder, being the *details*, are drawn quarter-size.

Remarks by Ellwood Morris, Esq., C. E.

We invite attention to the foregoing plan of railway superstructure, as embodying in a great measure, the experience acquired by the railway practice of the country.*

In 1838, Messrs Knight and Latrobe, the distinguished engineers of the Baltimore and Ohio Railroad, were specially commissioned to visit the most important railways in the United States, with the view of availing themselves of the experience of the whole country, in framing a plan for a new track, then about to be laid between Baltimore and Frederick, to replace the original superstructure, of which the wood work had decayed and required renewal, and *the stone* continuous bearings had ceased to give satisfaction.

The results of the observations of these engineers were reported to the Directors of the Baltimore and Ohio Railroad Company, in an able and elaborate memoir they discussed in detail the merits of the various plans of railway which came under their observation; and ultimately recommended a superstructure having a sub-sill and cross-ties, surmounted by a rolled iron H rail of 50 lbs. to the yard, in lengths of 18 feet, with angular joints, and for which the cross-ties formed isolated bearings of 2½ feet asunder, from centre to centre, except at the ends of the bars, where the bearings were made but 1¼ feet, conformably to Barlow's experiments; this superstructure was designed to be embedded in a broken stone ballasting, of 1 foot deep; and many miles upon this plan were laid in 1839, and have since been in constant use.

Though there are, of course, some variations in the details of the fastenings, &c., the superstructure above described differs from that adopted in 1838—at the suggestion of the same gentlemen—mainly in two particulars:

* From an inspection of the railways of general trade, which have been the longest in use, the writer is strongly disposed to conclude, that it will eventually be found advisable in such railroads as carry a very heavy traffic, and the earthworks of which have acquired the requisite stability, to lay the superstructures in *a bed of concrete*, as has been suggested in the London *Mechanic's Magazine;* the expense of which, in such cases, would probably be compensated by the additional smoothness of surface, and freedom from derangement, which such a foundation might fairly be expected to impart to railways.

1. In having *a continuous bearing of timber* beneath the rolled iron rail, upon which it rests throughout its length.

2. In the adoption of the U bridge, or trough section, for the iron rail, in lieu of either the T or H patterns.

These two essential variations from the plan of the railway superstructure, recommended by Messrs. Knight and Latrobe, in 1838, are fully justified, if not absolutely demanded, by the practical experience upon these points, now dawning upon the country; which at an earlier period in the history of railways could not perhaps have been foreseen, and certainly was not anticipated.

With regard to the first point, a close observation of such of the American railroads as have been the longest in use—possessed of the largest trade—and travelled by the heavy locomotive steam engines, which are now so common, will fully satisfy any professional man, that the alternate succession of "*rigid points and flexible spaces*," which inevitably results from the employment of *isolated bearings*, tends to a more rapid destruction, both of the locomotive machinery and of the road itself, than is likely to ensue, where the iron edge rails are sustained upon *continuous bearings of timber* of heavy proportions; which plan has also the recommendation of having already been practically tested upon the Baltimore and Port Deposite, and Washington branch railroads in this country, and the Great Western, and London and Croydon railways in England—with satisfactory results in each of these cases, so far as the writer is informed—besides being employed upon some other important railways in America, which are now in the course of construction.

Concerning the second point, or the sectional form of the rail—we will observe that the top table of the bars, upon which the wheels run, in the T and H forms—being supported in the centre alone by a single upright stem, in thickness about one-fourth only of the width of the head—soon crushes off on one side or the other of the centre, and renders it necessary to reverse the position of the bars.

On the Baltimore and Ohio Railroad, as the writer is informed, *already* has occasion been found to reverse the position of a number of the bars (of the track laid with the 60 lbs. H rails in 1839) *whose inner flanges have partially peeled off!* and upon the Columbia Railroad, which has been *but seven years in use*, rolled iron rails of the T and H forms may be seen in every stage of destruction; and though a portion of the disintegration which may there be witnessed, is undoubtedly owing to the intrinsic structure of rolled iron, and hence can only be postponed, and not annihilated, by any change of form or pattern; still it must be admitted, that if the top table of the rail had been so supported as to prevent it from being forcibly disrupted from its vertical stem, and thus render it subject alone to the natural exfoliations, which occur when malleable iron is exposed to a series of great rolling weights, the durability of that railway would have been essentially increased.

The sort of support to the head of the rail, which practice now shows to be necessary, is given by the double stems of the U section, and not by the single one of the T figure; consequently, it seems to the writer, that experience on existing works demands in future ones the adoption of the former pattern, in outline at least; for it is a question which time alone can determine, whether we shall not finally come to a solid bar rail as the best; for the present, however, it will probably be the proper course to use the U rail as now rolled hollow, in which form, as it can be made as light as the T and H patterns, its superior durability will gradually cause rails of the latter figure to pass from use, and give place to those of the former pattern, unless a superior section should meanwhile be introduced.

To support these views, it would be easy to cite further examples of the decay of rails of the T and H forms; but it seems scarcely to be necessary, and upon the whole, we are disposed to conclude that the experience of the country, up to this time, indicates the propriety of adopting, in future railway superstructures, *a continuous bearing of timber laid with a U rail, upon a suitable substructure*, in preference to any of the other plans now in use, most, if not all of which, seem on trial to possess fewer practical advantages.

In fine, the new superstructure of the Baltimore and Ohio Railroad appears to combine in its plan a sufficient provision to satisfy the most important requisites, in favour of which the railway practice of the country has pronounced, viz.—

1. That to guard against disturbance by frost or rainy weather, the superstructure ought to be embedded in a *ballasting*, entirely pervious to water, and of a sufficient depth.

2. That to prevent the track from spreading laterally, numerous *cross-ties* should be employed.

3. That to prevent unequal settlement of the *cross-ties*, (which also form detached supports for the rails or continuous bearings,) *sub-sills* of wood are indispensable.

4. That to render the road more smooth, more equal in strength throughout, capable of carrying greater weights than roads of

isolated bearing, and exempt from "rigid points and flexible spaces," *continuous bearings of timber* ought to be employed to carry the iron rail.

5. That the iron rail itself ought to be of the U pattern, (either hollow or solid,) as superior in durability to any other known form of section now in actual use, whilst it is very stable in position, and cheap in its fastenings, when properly laid.

6. That the iron rail-bars ought to be firmly fixed at their middle parts, to cause expansion and contraction to take place both ways from their centres.

MESSRS. LILLIE AND SONS' BOILER FURNACE—INVENTED BY MR. PARKES.

Sir,—In your 976th Number, I observe a letter from your correspondent, "H. H.," from Manchester, accompanied by an engraving, in which credit is taken for the furnace, as an invention of modern date. Now, sir, I cannot avoid stating that your correspondent, while he takes credit for "simply communicating the result of private and personal experience, without fee or reward," has omitted to mention that this very plan, as adopted by Messrs. Lillie and Sons, is neither more nor less than that of Mr. Josiah Parkes, patented above twenty years ago—it is, in fact, as given in your last Number, identical with Mr. Parkes's patent.

It may just be possible that your correspondent was not aware of the fact. In justice therefore to Mr. Parkes, I beg to add this fact to those stated by "H. H." In this instance we have a striking corroboration of the truth of your observations respecting the injurious effect of the "Leeds Smoke Nuisance" pamphlet, which has thus brought forward, under the name of Lillie and Sons, a plan of twenty years' standing, and which, though possessing unquestionable merit, and in many instances eminently successful, under careful management and good "looking after," has, nevertheless, not carried the public with it, and has literally gone into disuse since Mr. Parkes himself ceased to take any interest in the matter.

"H. H." informs us that "a similar plan may be also seen at Messrs. Horrocks', of Preston." It would have been but common candour to have stated that that very furnace of Messrs. Horrocks' was actually erected under Mr. Parkes's own direction.

"H. H." observes that "in a former furnace which they had with Stanley's feeders, the consumption of coal was 20 lbs. per horse-power per hour; they now have a more regular supply of steam" (with Parkes's plan of furnace and air feeder by a double or hollow bridge,) from 13 lbs. of coal per hour; a saving, in this instance, of 35 per cent.; but what they strangely "estimate at 20 per cent. average." Now Stanley's plan has nothing to do with the admission of air, which is the very essence of Parkes's plan. Stanley's is in fact but a mere mechanical feeder, and is any thing but a "smoke burner."

"H. H." concludes by "relying on your willing co-operation to make this very useful plan as extensively known to the public as it is freely presented to them." To this I have only to add, that this plan so freely presented to them may be seen in the London Journal of Arts as the undoubted and legal property of Josiah Parkes, the patentee; and that "H. H." has no right to claim merit for presenting to the public what did not belong to him.

Query. Was this the boiler which lately exploded on Messrs. Lillie's premises, owing, as was stated at the time, to a deficiency of water?

I am, Sir, yours, &c.,

P.

Manchester.

MESSRS. LILLIE AND SONS' BOILER FURNACE.

Sir,—I have read in the number of your Magazine for the 23rd of April, the letter of your correspondent "H. H.," which is so calculated to mislead, that I feel assured you will readily admit a correction of its absurd errors, in relation to "Messrs. Lillie and Sons' Boiler Furnace," and certain trials of "Stanley's Feeder."

Your correspondent has made a wholesale appropriation of the paper in Mr. West's pamphlet without acknowledgment, and has thus managed to make what was already sufficiently mysterious in itself still more confused. The case appears to be simply this: Twenty years ago Mr. Josiah Parkes introduced a split bridge, admitting a sheet of air to the gases immediately as they passed over the bridge. This plan, long practised, is exceedingly well known. At Messrs. Horrocks' and Co., Preston, it has been used ever since its first introduction. This plan of Mr. Parkes', Messrs. Lillie and Sons', engineers, have introduced at their works, in Store-street, Manchester, their furnace possessing no other recommendation than good workmanship, for certainly no improvement of any kind affecting the principle of the invention have they introduced. The very same kind of furnace, as set up.

during the existence of the patent, may still be seen at many old establishments in Manchester. With this explanation, what becomes of your correspondent's "appeal," in behalf of a *piracy*, for such it would be, if fortunately he were not excusable for his errors on the ground of his extreme simplicity and ignorance?

There is some incongruity in the account given in Mr. West's pamphlet, which opens with the remark, that the parties in question "have communicated a method, *never before published*," while directly afterwards we are informed respecting the main feature of the plan, that the "air is admitted into a passage through the bridge (the split bridge of *Parkes' expired patent*)."* Mr. West may naturally have thought, that the hitherto secret process pursued at the furnace at Store-street, and probably forwarded to him with a neat drawing and the inviting announcement "*never before published*," must in some of its other details be a unique gem of engineering skill. All Messrs. Lillie and Co. may have meant to be implied, was, no doubt, neither more nor less than the simple fact, that they then made known, for the first time, their having recurred to an old invention with satisfaction, never supposing that any one would start up to laud them for "a plan"—the result of "their own private and personal experience."

Your correspondent, who commences in a very pathetic strain, eulogizing those who do not make "a traffic of their knowledge or skill," evinces the possession of very little of either to traffic in, himself. He adopts a sweeping censure of Stanley's Feeder, and talks of the comparison of the present with "a former furnace," and he might have added also, a former boiler. Nothing can be more unsatisfactory than such unfair and unequal comparisons; neither the same boiler, the same furnace, nor the same grate being employed to test the consumption of the coal.

Your correspondent seems to be a very young "smoke doctor," for he first checks himself in speaking of smoke as being capable of "*combustion*," and then with admirable complacency (our plagiarist) acquaints us, that this plan, at Store-street, "is stated to have the effect of *completely consuming the smoke*." This little mosaic of right and wrong may amuse the critic, but it is not with any such feeling that I have endeavoured to expose, as briefly as possible, the most material errors committed in this instance, in a matter which is just now exciting deserved attention, and when we require the direction of correct information.

It is important to bear in mind, that furnaces of this description, to be rendered available on the best principle, are only charged with coal at starting; it is a system of slow combustion, and requires large grate surface* and ample boiler room, which circumstances are apt to be overlooked; and it generally happens that it is only when parties are on the point of "coming to business" with the engineer, to traffic in *his time and material*, if not his "knowledge or skill," that the disappointed manufacturer finds he cannot take down his Stanley's Feeder, or enlarge his grate, or get a new and more capacious boiler, or, in short, avail himself of "H. H.'s" suggestions.

I am, Sir, yours truly,

I. B.

CASTING SPECULA—MR. LASSELL'S OBSERVATORY.

Sir,—I observe in No. 965 of the *Mechanics' Magazine*, dated the 5th of February last, a letter from Mr. Robert Jones, of Newcastle, which refers in a complimentary manner to a communication I formerly made to that publication on the art of casting specula, and expresses a desire that I would prosecute the subject and describe the methods of figuring and polishing.

I have long been interested in the construction and use of Reflecting Telescopes, and if I have been able to devise any im-

* Mr. Josiah Parkes, C. E., whose invention is here alluded to, speaking of the Argand Furnace of C. W. Williams, Esq., (see the No. of *Mech. Mag.* for Oct. 9, 1841,) very ingenuously observes in a published letter to that gentleman —

"I am now desirous only of making a few observations on the general introduction of your system, which cannot fail to benefit its employers and improve the salubrity of the atmosphere.

"I am the more anxious to do you this justice, as it has been currently and confidently stated, that your plan differs immaterially from that patented by me, more than twenty years since. This is not correct. You have provided an important addition to my plans: viz., a more immediate and intimate diffusion of the air amongst the inflammable gases at the only place where these gases can be encountered and inflamed This is a chemical improvement which directly leads to a practical advantage, as compared with my plan, viz., that you have no need to change materially the habits and practice of the fire men. My method requires for its perfect action a specific mode of charging and managing the furnace, which it was difficult to induce the masters to enforce or their servants steadily to practise.".—Ed. M. M.

* By the engraving it appears Messrs. Lillie and Sons have a wagon boiler, only 27 feet long, with a fire-place having 2 feet dead plate, 9 feet bars, and 1 foot 3 inches clinker plate, in all 12 feet 3 inches. Seeing these disproportionate measurements, I am led to believe that the principle carried out applies equally to the boiler being unnecessarily large for the engine, and most likely even the engine not working to its estimated power.

provements it will give me pleasure to make them public; but as it is only a portion of my leisure hours which is devoted to that object, I can accomplish but little. I will not, however, lose sight of your correspondent's suggestion, and, should time permit, I may at a future opportunity trouble you with a letter or two upon the subject.

In reply to Mr. Jones's enquiry about my observatory, I beg to say, that an ample description of it accompanied by engravings, will, I believe, appear in the forthcoming 12th volume of the Memoirs of the Royal Astronomical Society.

I am, Sir, your most obedient servant,

Wm. Lassell, Jun.

Starfield, West Derby Road,
Liverpool, April 29, 1842.

VELOCITY OF WATER THROUGH PIPES.—MR. ROFE'S EXPERIMENTS AT THE BIRMINGHAM WATER WORKS.

[From Report of Lecture by Dr. Melson in the *Midland Counties Herald.*]

The calculations for the head of water necessary to keep up a given velocity for every 100 feet run of pipe, have been so ably deduced, from experiment, by Mr. Rofe, of the Birmingham Waterworks, that the lecturer could not forego the pleasure of pointing them out a little more in detail, and of giving the tables by which the necessary calculations were effected. The tables were two, and were both deduced from absolute experiment—not from experiments conducted by means of tin tubes of small diameter, fit only for laboratory uses, as there was too much reason to fear many of the tables previously published had been constructed, but from the absolute cast iron tubings themselves, as laid down in Birmingham and its vicinity. The tables were two: in the first V represents the table of velocities in feet per minute, and T the constant numbers for those velocities:—

V	T
60	8·62
70	11·40
80	14·58
90	17·95
100	21·56
110	25·35
120	29·70
130	34·
140	38·90
150	44·
160	49·50
170	55·66
180	62·13

In the latter D represents the diameter of the pipes in inches, and t the constant numbers for those diameters:—

D	
3	
4	·028
5	·053
6	·078
7	·104
8	·134

As an application of these tables, the following problem was proposed; it having been premised that the formula for their use was—

$$\frac{T}{D+t} = H$$

where H represents the height, or head of water. It is required, then, to determine what head of water will be necessary to send water by an engine through 1,500 feet of six-inch pipes to an elevation of 80 feet, at a velocity of 180 feet per minute. Now, by the table, we see that the constant number for 180 feet velocity is 62·13, and the constant number to be added to 6 inches is ·078,

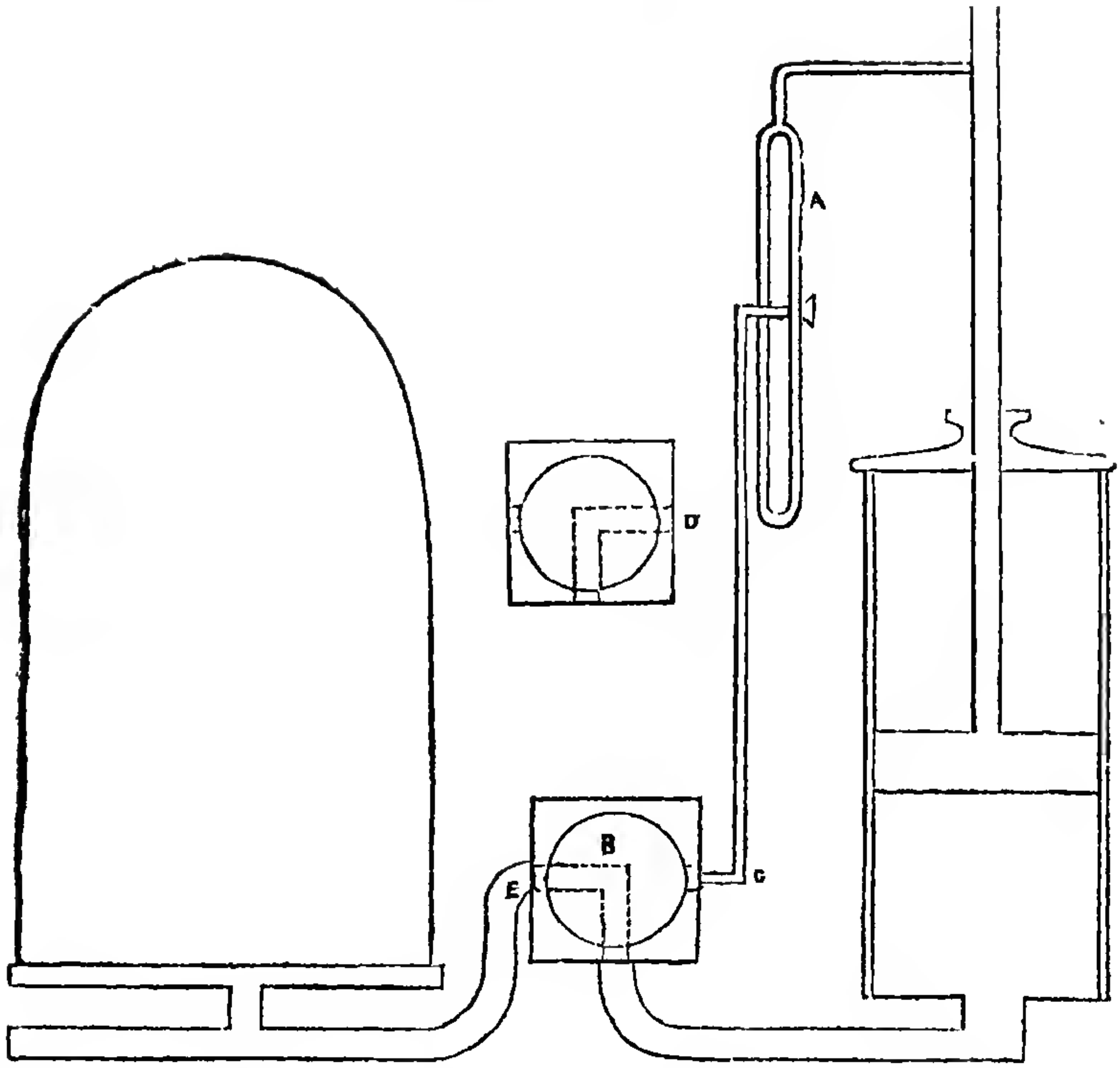
$$\text{and } \frac{62{\cdot}13}{6{\cdot}078} = 10{\cdot}22 \text{ inches.}$$

which is the head of water required to keep up the velocity of 180 feet per minute for every 100 feet run; which, being multiplied by 15, (the number of hundred yards through which it has to pass,) gives 153 inches, or 12 feet 9 inches. This, added to 80 feet, will give 92 feet 9 inches as the column of water which the pump must lift.

WRECK OF "LE TELEMAQUE."

The operations on this long-lost vessel, which have been suspended since the setting in of the stormy weather last November, are to be recommenced forthwith, and with a degree of vigour which gives good hopes of early success. The proceedings of last year engaged general attention in France, as much on account of their novel character. and the great activity with which they were conducted through a most unfavourable season, as in consequence of the golden harvest anticipated from the raising of the vessel. The parties interested in the salvage have collected evidence in France of the existence, on board, of specie and bullion to the enormous amount of 33 millions of francs, besides some valuable paintings by old masters—which last, however, can scarcely be expected to have survived their long submersion. A sum of 2,500,000 francs, in gold, despatched to this country by the unhappy Louis XVI., is stated to have formed a portion of this precious cargo. It is noticed as a singular coincidence, that the Annual Register for 1789 mentions the fact, that the plate of that monarch had been sent to the Mint to be coined for the use of the royal family, a little before "Le Télémaque" was despatched from Rouen for England.

IMPROVED AIR PUMP.



Sir,—The accompanying sketch represents a novel plan of an air-pump, which I contrived to suit the lecture table. It exhausts the receiver better than the instrument which is provided with silk valves, with the additional advantage of not being liable to injury.

A is a slot attached to the piston rod. At the proper time it moves the stopcock B, by the pin C, so as to allow the piston, during its descent, to expel the air through D, which it had taken from the receiver by E. The expense of constructing such an instrument is moderate.

My brother-in-law, Mr. Robert Morgan, has suggested that a double action would be produced by a four-way cock, to be moved by an eccentric, as in the steam-engine. In this case the piston-rod moves through a stuffing-box, and is surmounted by a horizontal slot, in which a crank revolves—a motion too well known to require further description. By reversing the action, the instrument becomes *a force pump* instead of an *air-pump*. Mr. Morgan has constructed the apparatus on this principle, and the effect is beautiful.

I am, Sir, your obedient,

WILLIAM LOVER, M. R. C. S. L

Dublin, 56, Amiens-street.

SINGULAR OPTICAL ILLUSION.

Sir,—I send you a description of a simple apparatus for showing a new optical illusion. When the polished ring A, is rapidly turned round by means of a multiplying wheel B, and the sun is shining on it brightly, the appearance is, that of a hollow transparent globe, with a black rod, or axis, passing through the centre; moreover, the shadow of the same is apparently projected on the sides of the

imaginary globe, precisely the same as if an intensely black rod had been placed in a glass sphere and whirled round. I have tried the experiment hundreds of times, and always the same appearance presented itself: the ring need not be larger than those attached to bed curtains, &c. I followed at first a still more simple method than that just described. The bright ring shown in

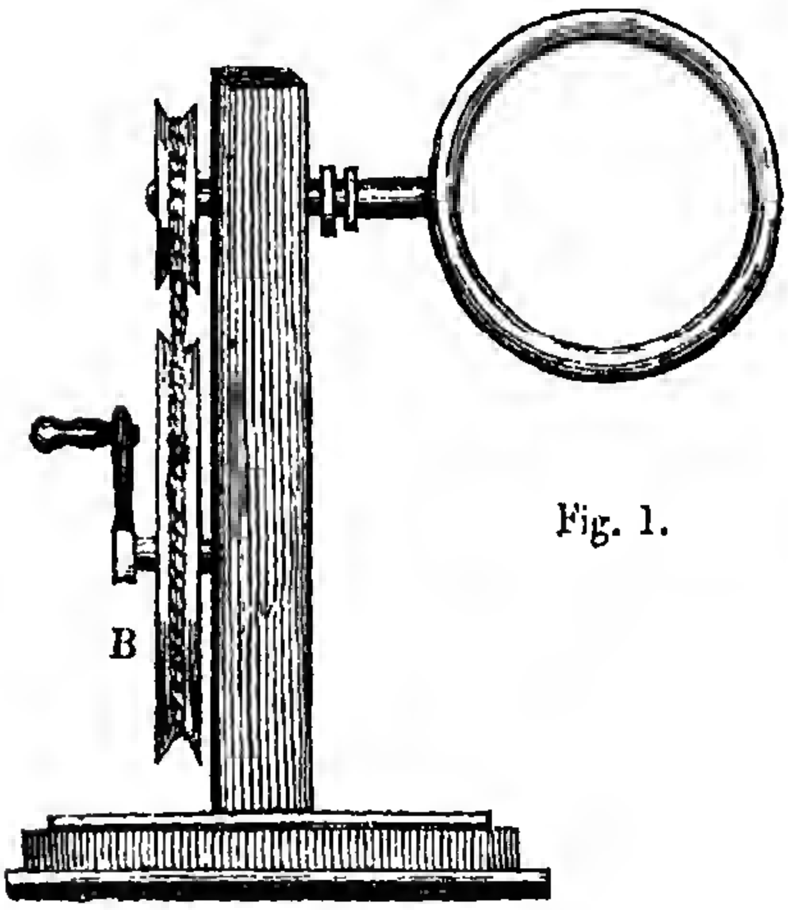


Fig. 1.

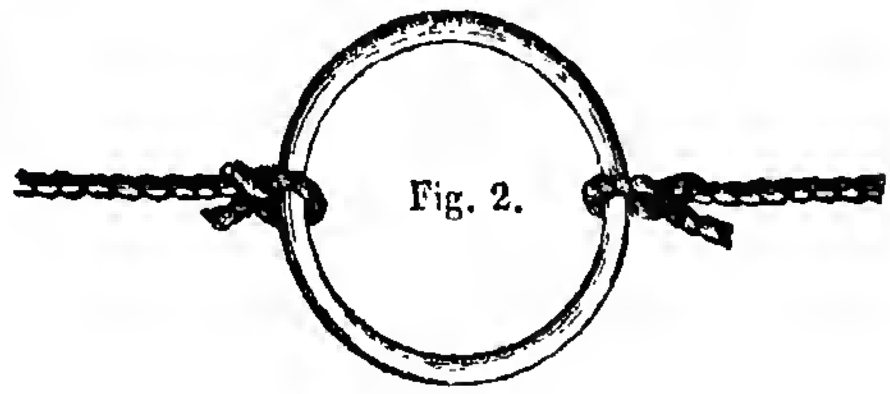


Fig. 2.

fig. 2 was rapidly twirled round in the same manner as that optical toy, the *thaumatrope*, when the phenomena appeared as before described. If the outside portion of the ring be painted black, which can be easily done, especially if the ring be a large one, the imaginary object takes the form of a hemisphere, the black axle and its shadow still remaining the same as before.

T. W. Naylor.

THE SYMINGTON METHOD OF CONDENSATION.

Sir,—The "Symington System of Condensation" having acquired your good opinion, may I request that you will give insertion to the following letter in its favour from Mr. Fletcher, the spirited proprietor of the vessel at Hull fitted with a condensing apparatus?

"Goole, April 27, 1812.

"Mr. W. Bowie.

"Dear Sir,—In answer to your letter, of the 26th instant, I have much pleasure in saying, since your condensing apparatus was put upon my little steamer, the *Fletcher's Despatch*, it has not cost me one shilling, and to all appearance is as good and as fast as ever it was. I am perfectly satisfied with it, and I hope to hear of many ships adopting it. I regret we are not nearer to you, that gentlemen might have an opportunity to test its good qualities.

"I remain, dear Sir, yours truly,

(Signed) "Joseph Fletcher."

It would be well for the prosperity of our steam shipping, (not at present over and above remunerative,) if all steam-boat owners would only, like Mr. Fletcher, have the courage and good sense to think and determine for themselves. The *Fletcher's Despatch*, fitted with the Symington apparatus, has been now working successfully for about two years, in one of the muddiest rivers in England, at a pressure of 14 lbs.; and the saving of fuel, to say nothing of the saving in boilers, &c., has been full one-fourth.

I remain, Sir, your most obedient servant,

Robert Bowie.

Burr-street, May 3, 1842.

THE DOUBLE ROTARY ENGINE—DISCLAIMER BY COUNT PREDAVAL.

A Monsieur l'Editeur du "Mechanics' Magazine."

En reponse à l'article qui a paru dans vôtre Journal du 26 Mars 1842, j'ai l'honneur de vous prévenir que je n'ai jamais formé aucun comité, ni emprunté aucune somme sur ma patente, "An Engine for producing Motive Power applicable to various useful purposes," et que toutes les manœuvres ont été employées par le Sieur de Mancel, 13, Thayer-street, Manchester-square, qui était mon interprete, qui n'a aucun droit dans la patente, et auquel je n'ai jamais donne aucun pouvoir. Quant à la bonte du système, je défie qui que ce soit de prouver le contraire par le langage de la science et par la pratique. Veuillez je vous prie avoir la bonté de placer ma réclamation dans votre plus prochain numéro.

C. DE PREDAVAL,

16, Great Marylebone-street.

(Translation.)

In reply to an article which appeared in your Journal of the 26th of March, I have the honour to inform you that I have never formed any committee, nor borrowed any money on my patent for "An Engine for producing Motive Power applicable to various useful purposes," and that all these manœuvres have been the work of M. de Mancel, 13, Thayer-street, Manchester-square, who was my interpreter, who has no right whatever in the patent, and to whom I never gave any authority to act for me. As to the merits of the system, I defy any one to disprove it, either theoretically or practically. I beg you will do me the favour to insert this, my disclaimer, in your next Number.

I am, &c.

INSTITUTION OF CIVIL ENGINEERS.—MINUTES OF PROCEEDINGS OF SESSION, 1842.

February 22, 1842.

"*Holborn Hill, and the Plans for its Improvement.*" *By John Turner.*

This communication chiefly consists of an examination of the various plans which have been suggested for diminishing the acclivity of that crowded thoroughfare. An idea of its thronged state is given from Mr. Whishaw's evidence before a committee upon Metropolitan Improvements, in May, 1838, wherein he assumes the fair average annual amount of traffic between Fetter-lane and the Old Baily at "20,000,000 pedestrians, 871,640 equestrians, 157,752 hackney coaches, 372,470 carts and wagons, 78,876 stages, 82,258 carriages, 135,842 omnibuses, 460,110 chaises and taxed carts, and 354,942 cabs."

The necessity for ameliorating this great thoroughfare has been generally acknowledged, and great changes have been made in the locality since the rivulet called the "Old Bourne" took its course down the hill into the Fleet river, which at that time had wharfs on either side for landing goods from the barges, which came up as far as Holborn Bridge. About the year 1733 the arching over of the channel of the Fleet was commenced, and subsequently was extended to the Thames, forming at present one of the main sewers, having its outlet at Blackfriars Bridge. On arching over the Fleet the ground at the bottom of the hill was raised as much as possible; indeed all that can be done by filling up (having reference to the surrounding levels), would appear to have been done at various intervals.

Some interesting tables are given of the rates of acclivities of some of the principal thoroughfares in London.

St. James's-street, 660 ft. from Piccadilly, is	1 in	27
Waterloo-place, ending at Piccadilly	1	25
Haymarket, at 490 feet from ditto............	1	22
Strand, opposite Northumberland House...	1	33
Charing-cross, from ditto towards Whitehall	1	37
Southampton-street, from the Strand	1	19
Fleet-street, opposite Salisbury-court	1	42½
Ludgate-hill, ending at St. Paul's Churchyard	1	25
Holborn Hill, varies from . ... 1 in 16½ to	1	23
Skinner-street, varies from... 1 „ 24 to	1	29

March 1, 1842.

"*Description of the Permanent Way of the South Eastern Railway.*" *By John Pope, Grad. Inst. C. E.*

This communication commences with a general description of the slopes of the cuttings and the embankments of the line, and explains the mode of ballasting and the quality of the materials employed. On either side of the bank of ballast, and below the level of its bed, there is an open drain, 3 feet in width, extending throughout the line, which ensures perfect drainage from beneath the sleepers. The different works connected with the laying of the rails are then successively noticed. The sleepers are placed transversely, and differ in shape from any hitherto employed. They are of Baltic fir, and are formed by a square balk being diagonally divided so as to cut out four triangular sleepers, which are laid with the rectangular point downwards, which form has as much bearing surface as one of twice the cubic content cut out as a half balk in the usual manner. The advantages arising from this form in the economy of timber, the facility of packing, and the improved drainage of the ballast in contact with the sleepers, are pointed out, and the apparent disadvantage of the tendency to act as a wedge, is combated by showing that the inclination of a right angle exceeds the limits within which the principle of the wedge obtains. The chairs are of a peculiar form designed by the engineer to combine lightness with strength; they are cast on a plan invented and patented by Messrs. Ransome and May, of Ipswich, whereby the inward inclination of the rails, instead of being made to depend merely upon the rail layers (as is usually

the case), is effected entirely by the shape of the cavities of the chairs, which are all cast with peculiar accuracy. The uniformity of inclination attained by this improvement greatly diminishes the lateral motion of the carriages, observed on almost all other lines of railway. The chairs are placed horizontally on the sleepers, and are fastened down with trenails of oak compressed by the patent process of Messrs. Ransome and May. The wedges employed to secure the rails in the chairs are similarly compressed. Details are then given of the rails, which are parallel, with their upper and lower tables of equal breadth: of the amount of compression of the wedges and trenails, their dimensions, shapes, &c.

The author concludes by stating, upon the authority of Mr. Barlow, the resident engineer of that part of the line, that the passage of 70,000 tons of ballast over several miles of the "permanent way" already completed, has not rendered the slightest repair necessary, although the weather has been very unfavourable.

The paper is accompanied by a drawing showing the construction of the permanent way, and it was illustrated by the exhibition of a pair of sleepers with two pieces of the rails placed in the chairs, which were fixed down with the compressed trenails, complete as on the railway; all the tools employed in laying the permanent line; and specimens of teak, oak, mahogany, hornbeam, walnut, and other timber, compressed and cut so as to show the subsequent form of the sap vessels.

In answer to questions as to the compressed fastenings, Mr. May explained that the peculiarity of the system consisted in the fibre of the timber being compressed equally from the circumference to the centre. The pieces of wood for the wedges were cut out with parallel sides and forced by hydraulic presses into tapering moulds; whilst in those moulds they were subjected to the action of heat applied through the medium of low pressure steam, and after being allowed to cool, they were forced out of the moulds, and so long as they were kept dry would retain their form; but as the operation simply contracted the dimensions of the sap vessels without crushing the fibre, the power of capillary attraction was not destroyed, and when driven into the chair and exposed to moisture they swelled so as to remain perfectly tight. There was this difference between wedges so compressed and all others; that a true wedge was formed from a piece of wood cut parallel on all sides, whilst all former modes that he was acquainted with produced, not wedges but parallel pieces.

The diminution of the bulk of the trenails, by the process, is from 100 to 63, and of the wedges from 100 to 80. It is found that the wood does not swell until it is placed in a damp situation, as in the sleepers. Even the most solid woods, such as African teak, can be compressed without sustaining injury. Perfectly seasoned timber will not shrink after compression, but green wood will shrink after the process. One of the principal advantages of the compressed trenails is the firmness with which they hold into the sleeper. Around the iron spikes generally used, a sheath of rust is formed by the damp sleeper; the shaking of the carriages tends to draw them upwards, and the elasticity of the fibre around the hole in the sleeper being impaired, it is of no use to drive them down again in the same place, and the chairs eventually become loose.

The mode of casting the chairs was described to be by placing an iron plate on each side of the pattern, ramming them up in sand, and using an iron core, which being sustained in its position by a projecting tongue falling into a groove in the side plates, preserves an uniform inclination of the rail in the chairs. Extraordinary precision is thus obtained, and only about 2 per cent. of waste-castings are made, although they are subjected to a rigid test, for if the bearing points allow the rail to vary $\frac{1}{16}$th of an inch from the required inclination, they are broken up. The iron cores do not unduly chill the metal, and the average strength is retained. The iron used is chiefly "Welsh Cold Blast."

Mr. Cubitt's object has been to lay a railway entirely upon transverse sleepers, of such a form as would expose the largest amount of bearing surface for the least portion of timber; that the bulk of the ballast should be beneath the bottom of the sleeper, where alone it is useful; to use only the best foreign timber; to have the rails rolled uniformly and sufficiently heavy; the chairs simple in form, possessing great regularity, and giving the inward inclination to the rail within the chairs, instead of depending upon the rail-layer doing it in fixing them; and that the fastenings should be simple, but firm, and not liable to breakage, or to be detached by the passage of the carriages.

With these views, he had directed four sleepers to be cut diagonally out of each square log of foreign timber, giving about $2\frac{1}{2}$ cubic feet to each sleeper; to place them with the right angle downwards, so that the ballast could always be consolidated by ramming, without lifting the sleeper, or digging around it, as with square, or other formed sleepers; two places are planed to receive the chairs, and one fastening hole bored in each sleeper; they are then kyanized in close tanks, completely filled with the pre-

pared solution, under a pressure of 80 lbs. per square inch. When placed upon the ballast, the joint chairs are first put down 15 feet apart, and the intermediate chairs loosely placed 3 feet apart; "cramp gauges," embracing the inside and outside of the rails, are then fixed between each pair of sleepers, and the wedges along one side driven up—one trenail being driven in each chair, the hole for which is previously bored in the sleeper by a gauge, to insure an equal projection on each side of the rail. A "guide tube," of an internal diameter to fit the spiral auger for boring the trenail holes, with the external lip tapered to correspond with the hole in the chair for the head of the trenail, is then used, and by its agency the holes are pierced with great accuracy, concentric with the hole in the chair, at the same time protecting the tool from being injured by the cast-iron. The intermediate chairs are then fixed in the same manner, and the operations are repeated for the opposite rails; the ballast is then consolidated by ramming. It is found that the work proceeds very rapidly; the ballast supports the sleepers throughout, and has no tendency to fall away from them; the water drains away freely, and hitherto the passage of the ballast wagons over that portion of the line which is laid, (although they are without springs,) has been productive of benefit rather than injury.

The inclination of the rail being given in the chair had insured such accuracy, that, after one day's traffic over it, the surface of the rails is rubbed equally throughout, and not alternately on either side, as is so commonly the case.

Mr. Cubitt did not claim the invention of the angular-formed sleeper, as Mr. Reynolds had used it before for his longitudinal bearing rails, but he believed that transverse sleepers of that form had not been previously laid down; nor did he claim the compressed wedges and trenails, or the peculiar mode of casting the chairs, the merit of these was entirely due to Messrs. Ransome and May, who had entered completely into his views and wishes, and executed them with extreme intelligence.

In answer to questions from the President, Mr. May replied that it had been an object to gain in the trenails and wedges the greatest amount of strength with diminished bulk, and also to cut away as little of the sleeper as possible in boring the holes; he had, therefore, introduced this method of compressing them, with a view, also, that in swelling from the damp they should fix themselves tight into the soft timber sleeper, and hold the chair fast down.

He hoped to extend the use of compressed trenails to ship-building, for which they were eminently adapted; if they were used, smaller holes would be bored in the timbers, and they would hold tighter than the trenails now used, which require to have the points split and wedged up, and the heads also divided and caulked, to prevent leakage through the open sap-vessels of the wood.

The President remarked that, on the Hull and Selby Railway, the chairs were fastened to the kyanized timber sleepers by uncompressed wooden trenails.

Mr. Cubitt was not aware of that fact; he had always found that uncompressed wedges and trenails would not hold tight. Some of the compressed trenails had been wetted by accident, and could not be afterwards driven into the holes in the chairs; they nearly resumed their original size, and then showed the marks of the turning-tool upon their surfaces. In answer to a question from Mr. Parkes, as to the comparative expense of laying the line, it was rather in favour of the system he had adopted, although the prices paid for the items separately were higher than usual, but the saving in labour, and the almost total absence of waste of materials, gave the economy. He then quoted a few of the prices paid; sleepers 6*s.* 6*d.* each, (ready to lay down, including kyanizing;) chairs 9*l.* per ton, free from faults in casting, the contractors for them replacing all that were broken in laying the line. Each joint chair, with three trenails and one wedge, 2*s.* 10*d.* Intermediate chairs, with two trenails and one wedge, 2*s.* 1*d.* each. The labour for laying the line was from 2*s.* to 3*s.* per yard running; the cost of fixing the sleepers, laying the rails, and ballasting complete, was from 1,500*l.* to 2,000*l.* per mile, including all expenses.

Mr. Macneill fully concurred in the importance of providing for clear drainage from the sleepers; and in the advantage presented by the angular form for ramming the ballast. The transverse sleepers, with such rails as had been used on the South-eastern Railway, were preferable to a continuous bearing, as they would prevent the gauge from widening, and preserve an uniform regularity of surface, which would tend materially to diminish the oscillating motion so common on railways, and which was so destructive to the engine and the carriages; altogether, this railway appeared to be the most perfect he had hitherto seen.

He was using, on the Dublin and Drogheda Railway, chairs of somewhat similar construction, with uncompressed wooden wedges and fastenings; they were very roughly cast in Scotland, with hot-blast iron, and the breakage was very great; they, however, cost less than 5*l.* per ton. He believed that chairs such as were cast by Ransome and May would be cheaper at 9*l.* per ton. The

uncompressed trenails were found in many instances to become loose. In ballasting the railway, as stone was cheap, the whole surface of the line was pitched transversely with thin stones, and then a good bed of broken stone used for ballast, in the same manner as Mr. Telford had proceeded with the Holyhead Road.

Mr. William Cubitt had compressed a considerable quantity of wood wedges, by forcing them singly, by a blow of a piston, through a taper steel mould; on leaving the mould they had attained their ultimate state of compression, and they were some time before they reassumed their original bulk; but he conceived that Mr. May's plan, by which they were dried in a compressed state, enabled them to retain their form longer. He considered the systems of preparation, and of laying the road, to be the most perfect hitherto executed.

Some years since, Mr. Horne had made a series of experiments on the form of timber beams, which presented the greatest amount of strength with the least quantity of timber; he found that a triangular beam placed with the base upwards was one-third stronger than any other form.

Mr. Colthurst inquired whether the trenails and wedges had been found to have lost strength by compressing. He imagined that they would not bear a transverse strain so well as before compression.

Mr. May replied that no experiments had been tried as to the relative transverse strength of timber before and after compression.

Mr. S. Seaward thought it was probable the timber did suffer somewhat from compression, but that did not militate against the system, as there must necessarily be an original excess of strength in the trenails, so that no inconvenience could result from the process.

The President observed, that although uncompressed trenails do draw out of the stone blocks, they hold fast in wood sleepers. The round trenails used to fasten the chairs to the sleepers on the Hull and Selby Railway, were of a proper size to fit the hole in the chair, and at the end a square head was left, which held the chair down.

Mr. Cubitt had frequently seen trenails or plugs driven into stone blocks to receive the iron spikes which fastened down the chairs; he believed they had also been used driving through the chairs into the blocks, but he was not aware that they had been used in wood sleepers, until he employed them on the South-Eastern Railway.

In answer to a question from the President, Mr. Lynde explained, that upon the Hull and Selby Railway, trenails were certainly used in conjunction with wooden sleepers, a portion of them were uncompressed, but the greater part were compressed like the wedges; the latter were supplied by Mr. William Cubitt.

Mr. William Cubitt only supplied the wedges, they were compressed as he had previously explained; he believed that the trenails and wedges generally used upon the London and Birmingham, and other railways, were compressed by being driven through steel rings, by heavy mallets, or by a press; they were most frequently used in the stone blocks to receive the iron spikes.

ABSTRACTS OF SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

THOMAS MACAULAY, OF THE CURTAIN-ROAD, MIDDLESEX, UPHOLSTERER, *for certain improvements in bed-steps, which are convertible into other useful forms and articles of furniture.* Enrolment Office, May 2, 1812.

The improvements comprehended under this patent are embodied in four different sets of bed-steps. The *first* is a three-tier set, which includes a portable water-closet, and may be readily converted into an easy chair. The chief peculiarities of construction are, 1. The supporting of the bottom step on a pair of folding-doors, which can, by the touch of a spring, be projected or withdrawn at pleasure; 2. The making of the bottom step to turn up in front on hinges, when not wanted; and, 3. Causing the action of the top step, as it is thrown back in order to convert the bed-steps into a chair, to turn over a pair of arm-rests, or pads, on the sides of the case, which now serve as the chair-arms. The *second* is also a three-tier set, but includes, besides a portable water-closet, a wash-stand, a dressing-table, and a bidet. The contrivances by which one piece of furniture is made to serve so many different purposes are very skilful, but too numerous and minute, (though simple withal,) to admit of an abridged description. The *third* is also a three-tier set of bed-steps, but convertible into a chair only by turning up the bottom step out of the way, or removing it altogether, and making a chair-back of the upper step. And the *fourth* is a two-tier set of bed-steps, including a night-commode, and convertible, by the shifting of the steps, into a chair, which may, by means of certain rack-work, be made either reclining or not reclining. The patentee describes also a water-sealed pail of a peculiar construction, and claims it as included under his patent, when used as a part of any of the improved sets of bed-steps before described.

There is a great deal of utility, as well as ingenuity, in these improvements; and they

come in good season now that steam navigation is multiplying so prodigiously the number of travellers by sea and river, and that the *multum in parvo* is become a matter of such essential importance in cabin furniture. The set of steps No. 3 would, we imagine, be found an excellent article, as well for libraries as for bed-chambers.

Edward Robert Simmons, of Croydon, Esquire, *for improvements in apparatus for preventing splashing in walking.* Enrolment Office, May 2, 1842.

These improvements consist in applying to the heels of boots or shoes a shield, composed of a thin piece of metal, which can be taken on or off at pleasure, and which, it is said, will effectually prevent all splashing from behind, by catching on its under side the mud that would otherwise rise up and rest on the trowsers.

The claim is to temporarily applying shields to the heels of boots or shoes, to prevent splashing when walking.

In our 181st Number, for October 27, 1832, we gave an engraving of a "mud protector," communicated by a Mr. Needham, of Birmingham, which differs but little in shape from that of Mr. Simmons, and will, we dare say, be found quite as efficacious.

Jeremiah Bynner, of Birmingham, Lamp Manufacturer, *for improvements in gas-burners.* Enrolment Office, May 2, 1842.

Mr. Bynner is the patentee of what goes by the name of the "Solar Lamp." His present improvements consist in a peculiar manner of feeding gas-burners with air, whereby "quiescence in the burning of gas is produced, flickering diminished, and combustion made more complete." These objects are effected by causing the whole of the air admitted into the burner to pass through a multitude of very small orifices. The air which is introduced into the interior of the burner goes through a metal cylinder, the sides of which are perforated with a number of small holes; and that which finds its way to the exterior of the flame is made to go through a circular plate, perforated in the same manner, which plate serves also for the support or gallery to the chimney-glass.

The claim is to the dividing or filamenting the currents of air in their passage to the interior and exterior of gas-burners, in the manner above described.

John Carr, of North Shields, Earthenware Manufacturer, and Aaron Ryles, of the same place, Agent, *for an improved mode of operating in certain processes for ornamenting glass.* Rolls Chapel Office, May 9, 1842.

The "improved mode" here patented is stated to consist in the application to glass "of the process usually called by glass-stainers *printing* with materials which have not heretofore been used in that way, and under circumstances which give great facility for, and make great improvements in, ornamenting glass."

First, as regards the *staining* of glass, the improved mode of operating is stated to be as follows. "Instead of mixing the staining materials now used for that operation, when levigated finely and dried, with oil of turpentine or other volatile oils, or water, as usual, we mix them with boiled linseed or other oil, such as is now used to mix with enamel colours, when printed on glass: and instead of floating the staining materials over the glass in a liquid state, as now practised, we print them on, or transfer them as impressions from, metal plates, in the manner now adopted in the operation of printing enamel colours, and proceed, after the material transferred has been well dried, to fire it for the colour required, in the usual way. When we operate with the same staining materials, so mixed with oil as aforesaid, on what is called pot metal, or on pieces of glass which are what is called 'flashed,' opaque and transparent shades are produced, leaving the surface of the glass quite smooth, and not raised in those parts, as in the common mode of applying body colour for the purpose of shading."

Second, as regards the operation of what is called *stopping-out*, the patentees give the following directions. "We also mix the materials used for that purpose into a composition with boiled oil, as aforesaid, and transfer printed impressions on to the glass with it, as before explained, covering such parts as are not to be acted upon, and can then float over the whole surface, including the parts so stopped out, with liquid staining composition, and fire it as usual, to produce the stain; after which, the glass being cleaned, the pattern so printed on it in stopping-out materials is exhibited in the original colour of the glass, and quite distinct from the stained ground; or a printed impression being transferred to the glass in stopping-out materials, as aforesaid, the remainder of the ground may be obscured, as it is called, in the usual manner, thus producing transparent patterns on obscured grounds."

Third, As regards the operation of what is called *obscuring* glass, the patentees say: "We also mix the materials which are used to produce this effect with boiled oil, and transfer impressions from engraved metal plates on to the glass; this produces obscured patterns on transparent grounds. Now, whereas it is evident, that in all processes for ornamenting glass by staining, stopping-out, or obscuring, the means we have discovered of mixing the staining, the stopping-out, and the obscuring materials with boiled linseed oil, so as to enable us to print with

the composition from copper or other engraved metal plates, gives us the power of greatly improving, perfecting, diversifying, and multiplying the combinations of patterns, grounds and devices, while it does not deprive us of the aid of enamel colours to add to that diversity as usual."

The claim is to the use in those processes for ornamenting glass, where staining, stopping-out, or obscuring materials are employed, of 1. the mode before described of transferring the said materials in the form of impressions from engraved plates of metal on to the glass, in the same manner as now practised in printing in enamel on glass, namely, by mixing the said materials with boiled linseed or other oil, and, 2. of the application of the staining material so mixed with oil, to pot metal or to flashed glass generally. The patentees add, that by "the said improved mode of operating with the said materials, we are enabled greatly to improve, perfect, render more exact, diversify and multiply the combinations of patterns, grounds and devices for ornamenting such glass as aforesaid, and to produce the same, so ornamented, at a cheaper rate."

PATENT LAW CASE.

Court of Common Pleas.
Thursday, May 5.
(Sittings in Banco.)

Gibson and another v. *Brand.*

This was an action for the infringement of a patent, which had been taken out by the plaintiffs for a new and improved process of manufacture from silk waste, in combination with wool, flax, and other fibrous substances. The trial, which took up three days, was held before Lord Chief Justice Tindal, at the Middlesex sittings after last Trinity term. The jury found a verdict for the plaintiff on all the issues except the second and third, which denied the novelty of the invention; and as to these issues, they brought in a special verdict, viz., that the invention was not new, but that there was an improved process, and not any new combination. A rule was obtained in Michaelmas term to enter the verdict on the second and third issues for the defendant, or to enter a nonsuit on the plea of not guilty, or to arrest the judgment on the fifth issue, which related to the specification. A cross rule was also granted for a new trial, if upon the argument the Court should be of opinion that the verdict on the second and third issues ought to be entered for the defendant.

Mr. Serjeant Bompas argued the case on the part of the plaintiffs, and *Mr. Serjeant Channell* for the defendant.

The Court said, that before they expressed any opinion as to the propriety of entering the verdict on the second and third issues for the defendant, they would dispose of the two minor questions in the case, the first of which related to a nonsuit, and the second to an arrest of judgment on the fifth issue. It had been contended, that as the grievance charged against the defendant was that he made, used, and put in practice the invention of the plaintiffs, and the evidence of infringement was a sale of some silk manufactured in the mode claimed by the plaintiffs as their invention, the plaintiffs were not entitled to retain their verdict upon the plea of not guilty. But the evidence went to show that the defendant ordered the articles to be made in the same way as the articles made under the patent of the plaintiffs, and that seemed to the Court sufficient to justify the allegation that he made, used, and put in practice their invention. There was no ground, therefore, for a nonsuit, and it did not appear to the Court that there was any sufficient foundation for arresting the judgment for the plaintiffs upon the fifth plea. The issue raised on that plea was, that the specification was sufficient, and the jury had found that it was sufficient, in point of fact, to enable a workman of competent ability to act upon it. The Court now came to the main and important question between the parties, namely, whether the defendant had a right to have the verdict on the second and third issues entered for him. The jury found upon these issues that there was no novelty in the invention, no new combination, but an improvement in the process. The question then arose whether, upon that finding, supposing it to be supported by the evidence in the case, the jury had found those issues for the plaintiffs or the defendant, and it appeared to the Court that the verdict should be *entered for the defendant on those issues.* The patent was taken out strictly and entirely for the process described in it; but upon looking at the specification, it appeared to them that the patent could not be supported in law, because the plaintiffs claimed in their specification more than they were entitled to. The Court could not read the description given of their invention without understanding them to claim the improvement in the machinery used for the purpose of producing the desired effect. Now, the finding of the jury was not in accordance with the specification, as it negatived any improvement in the machinery, and therefore the Court was of opinion that the defendant ought to have the verdict entered for him upon those issues. They also thought, upon a full review of the evidence, that there was no miscarriage at the trial, and the rule for a new trial must therefore be discharged.

Rule absolute for entering the verdict for the defendant upon the second and third issues.

NOTES AND NOTICES.

On the Protection of Iron by Zinc.—M. de Althaus, director of the salt works of Durrheim, has succeeded in protecting completely the evaporating pans of the works, 30 feet in length, by nailing to them on the outside bands of zinc, and he observes that it is not necessary that the two metals be nicely polished at the points of contact.—*Annales des Mines.*

New Propeller.—A trial was made at Liverpool, last week, of a new method of propelling steamboats, invented by Mr. E. Finch, for which purpose a small steamer had been constructed at the engineering establishment of Mr. Rigby, at Hawarden; the experimental trip was performed in so satisfactory a manner as to convince all parties that this new propeller is of great importance, and, when fully developed, will be as generally applied to sailing-vessels as to steam-packets. The invention appears a simple contrivance; the paddle-boxes are still preserved, but, instead of wheels, two plates are applied, the broadest parts of which are at their extreme ends, fixed obliquely at an angle of 10 degrees, one on each side of the vessel, at the ends of the paddle-shaft, these plates, or propellers, are made of wrought-iron, and appear very strong and compact, and about 11 feet long and 3 feet 6 inches wide in the broadest parts · they are entirely out of the water twice in the revolution of the paddle-shaft, when the engine is on her centres, and have the deepest hold of the water when the engine is at half stroke, or at its greatest power. They thus act like oars, or sculls; no back water is created, and the disagreeable beating of the paddle-boards on the water, and subsequent vibration of the vessel, is avoided.—*Mining Journal.*

Electro-Magnetism as a Moving Power.—The Consul-General of the Netherlands, in a communication dated the 18th ult., quoted by the *Mining Journal*, thus announces the removal of the hitherto great obstacle to the practical application of electro-magnetism as an effective propelling power.—" A private gentleman, Mr. Elias, of Haarlem, has just published the description of a new machine invented by him, for the application of electro-magnetism as a substitute for steam. The object of the inventor has been chiefly to remedy the defects which, in 1839, rendered the otherwise ingenious invention of Mr. Jacobi, of St. Petersburgh, a total failure, in as far as practical utility is concerned. Those defects originated, it seems, in the erroneous supposition that the power of the magnetic bars exclusively resides in their extremities—whence the form hitherto given to all electro-magnetic machines—viz., that of a horse-shoe—which, while it occasions an unavoidable interruption of the magnetic stream at each new inversion of the poles, at the same time leaves the power resident in the remaining part of the bars wholly unemployed. The new invention of Mr. Elias, on the contrary, has the very great advantage of rendering effective the full power of the magnetic stream uninterruptedly, and throughout the whole body of the apparatus. This consists of two concentric rings of soft iron, standing on the same plane, of which the external one is immovable, while that on the inside revolves round its own axis. By means of a piece of copper wire, wound about each of these rings, he has given them six magnetic poles, placed at equal distances from one another, the whole being so contrived that the one ring exerts its inducing power on the other throughout the whole circumference, and always at the same distance. A small, but very perfect, model of this important Invention is now open to public inspection here; and the result of its operation is allowed, by those skilled in such matters, to be such as to ensure the most triumphant success."

Ancient Bronze.—Among the Egyptian antiquities in the British Museum there are several chisels, saws, and other tools, made of bronze; and also remains of granite sculptures, which, supposing them to have been executed with these tools, show that they must originally have been of a hardness and temper equal to that of our best modern tools of iron and steel. No Egyptian tool of iron has ever yet been found; nor is there any trace of this metal having been used for such purposes in the days of the pyramids. A small bronze knife, found at Thebes, was, after being buried for at least 2,000 years, of so good an edge, that it was used for a penknife several months after its exhumation. How the Egyptians contrived to obtain bronze of so superior a quality is now unknown; it is one of the lost arts, the re-discovery of which, (chiefly, however, on account of the rust-proof property of this compound metal,) would be worth a diadem.

Aerostation in Ireland.—We understand that Mr. Charles Green, whose long and persevering exertions to perfect aerial navigation are deserving of so much praise, will most probably gratify our friends of the sister island by making some ascents from Dublin, in the course of the present summer. Not, however, in the " Great Nassau," (which is a pity,) but in some balloon of inferior magnitude; for, strange to say, there is not as yet a gas establishment in Ireland which could afford sufficient gas for the inflation of so vast a machine.

Ericsson's Steam Fire-engine Revived in America.—When I left New York, it was rumoured that the several insurance companies of that city had determined to have fires put out, thereafter, by steam.—They were having built a powerful steam fire-engine, to cost 6,000 D. It was building on a plan of Ericsson's, the inventor of the transversal screw-paddle for steam-ships. The engine was to weigh a little more than two tons, to have the power of 120 men, and to throw upwards of 3,000 pounds of water per minute, to the height of above 100 feet. Its power, and the quantity of water to be thrown, to be greatly increased over that which I have stated. It was to be called " Exterminator." Able engineers are of opinion that it will perform the work of at least six of our best engines, and it will have the advantage of a power that will never be worn-out by fatigue. The bore to which the hose will be attached is *fifteen* inches and three-quarters in circumference, and the mouth of the pipe will be much less—giving a great impetus to the volume of water, and throwing it to a greater distance than our best engines. It is so constructed, that, should it be necessary, three or four streams can play from the engine at the same time. The engine will be stationed in the fifth district, probably at or near Burling Slip. It is to be drawn by a pair of strong horses, and attended by a driver, an engineer, and a fireman.—*Le Cras's United States and the Canadas.*

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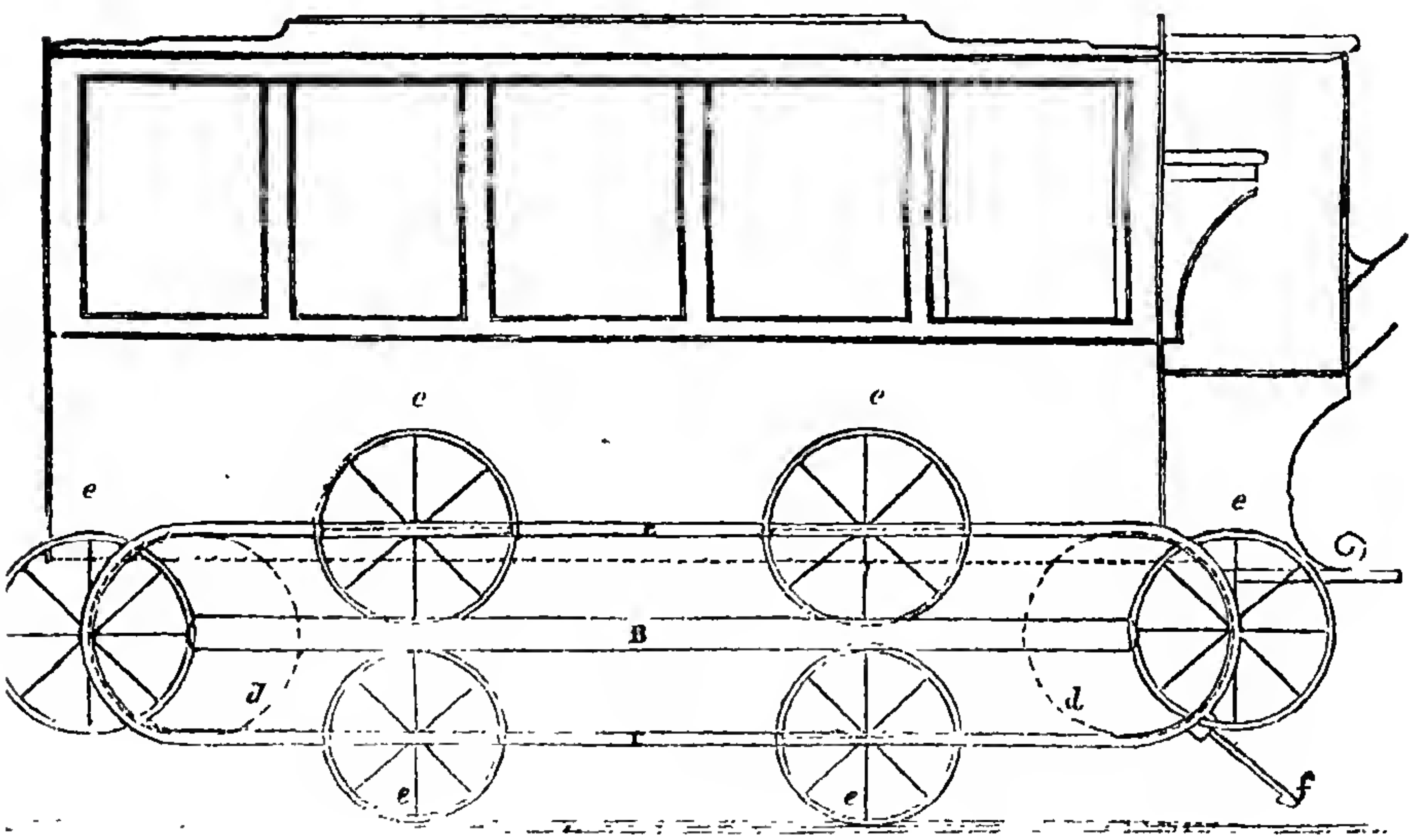
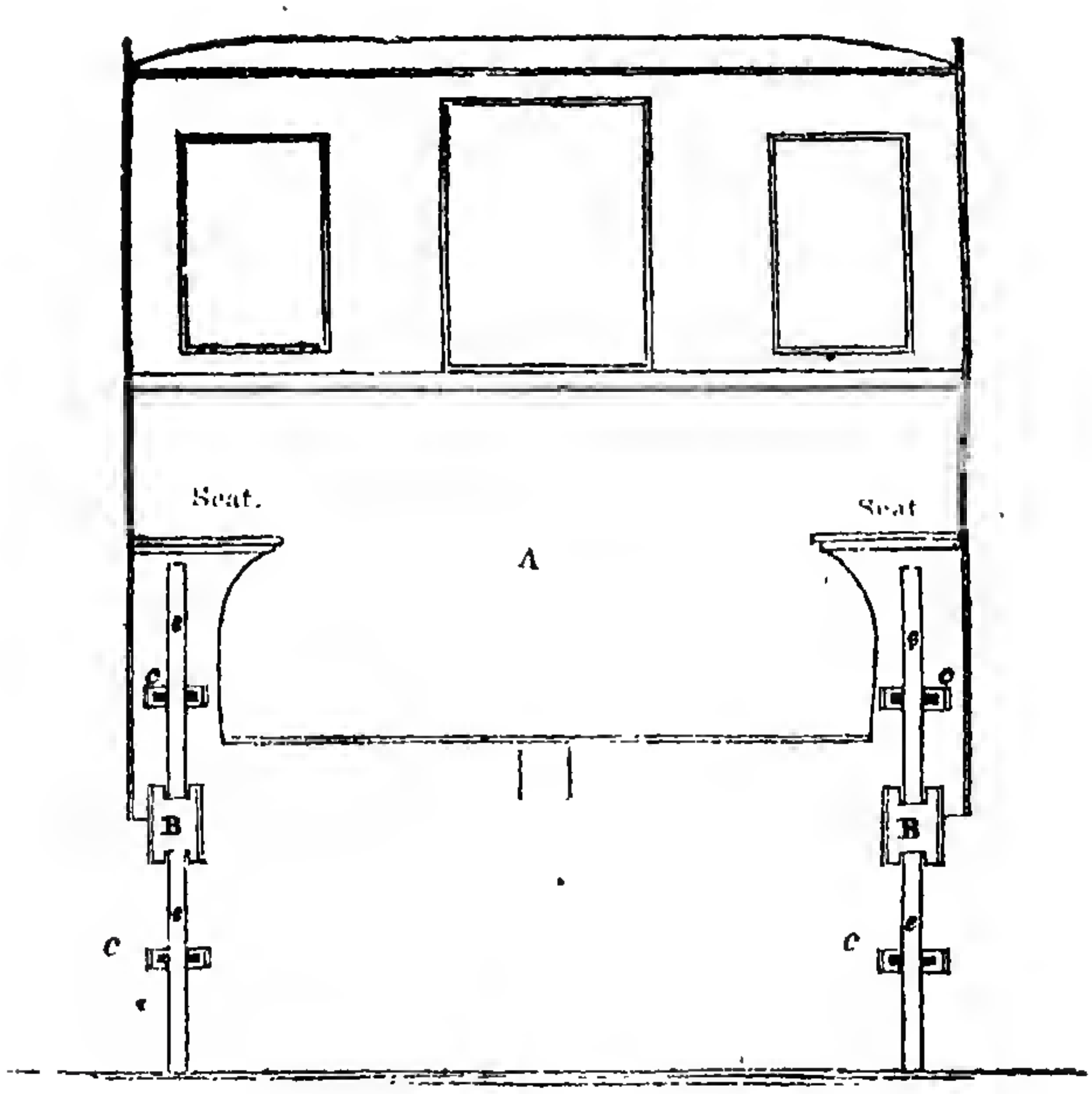
ROBINSON'S ROLLER CARRIAGE.





DESCRIPTION OF A CARRIAGE TO BE PROPELLED ON ROLLERS INSTEAD OF WHEELS.—DESIGNED BY MR. GEORGE ROBINSON.

Sir,—In accordance with your wish, I send you a description and sketch of a design for a carriage to be propelled on Rollers instead of Wheels. Yours, &c.,

GEO. ROBINSON.

Description.

A, is the body of the carriage, which is represented as an omnibus, but may be of any form.

B, a strong side frame with circular ends, 6 inches wide, with a groove 4 inches wide, and 1 inch deep, running round its upper and under surfaces and ends.

c c are guide-rails, of which there are two on each side the carriage; they are placed as seen in the side view—equally above as below the frame, and supported from it by brackets. One rail projects 2 inches *within,* and the other, 2 inches *without* the frame; both have a groove 1 inch square running round their faces next the frame.

d d are grooved friction-wheels so fixed as to turn freely on their axles within the ends of the guide-rails next the frame: they are slightly less in diameter than the span of the rails—their circumferences travelling just within the groove round the ends of the rail. An endless chain (not shown) composed of flat jointed links extends along the face of the grooves of the guide rails, passing over the friction-wheel at each end.

e e e e e e are wheels 2 feet in diameter and 4 inches broad at their circumference, fixed on small axles, which project 4 inches on each side.

These wheels are converted into rollers by distributing them at uniform distances around the frame, with their peripheries in the groove; their axles passing through a circular hole in the chain provided for that purpose, and into the groove in the guide-rails by which they are held secure and steady; the *whole weight* of the carriage resting on their peripheries; and their axles traversing the grooves nearly without friction.

Motion being given to the carriage, the friction of the rollers on the ground, by the tension of the chain, communicates motion to the whole series, insuring an uniform and continuous rotation.

It will be seen, by the cross section, that the upper series of rollers revolve under the seats, obviating the necessity of any additional *breadth* to the carriage. The whole being neatly cased in as low as the frame, the carriage will be as compact and elegant as any other. The body may be mounted on springs in the ordinary way.

f is a scavenger of a wedge-like form, projecting in front of the rollers, and a little above the ground. This scavenger being fixed in a tube, down which it is pressed by a spring, would serve to remove obstructions, by causing them to glide on either side; and on contact with any thing fixed, or above a certain weight, the spring would yield, and the scavenger being pressed backwards and upwards, would clear the object.

I have described this vehicle as adapted for horse-draught on common roads. But instead of the frame being grooved, and having flanges to the rollers, propellers to be brought in contact with the ground, (such as I have imperfectly attempted to describe in No. 975), may be used, or motion communicated to the friction-wheels by steam agency, when it will be applicable to railroads as at present constructed.

For steam on common roads it would require, in addition, a *guide*-wheel, so fitted as to be instantaneously available in turning, but used *only* when wanted.

This description of machine would, I think, have considerable advantage over the ordinary ones, in consequence of the amount of friction *in them* generated in the box of the wheel; the turning of which round the axle is, I conceive, similar to the raising of the load, by pressing under it a series of wedges; each portion of the box, as it comes round, having that duty to perform by being pressed under the axle, by which it is, in reality, constantly ascending an inclined plane—thus creating a large amount of friction. Whereas, on rollers the carriage has a level surface to travel on, and, as it is known that the friction of the periphery on a smooth good road is small, compared with that exisiting at the axles of wheels, so the friction generated in the passage of the rollers along the grooves of the frame, will be small also—the only friction at the axles, being that generated by the weight of the upper series of rollers in the act of being drawn forward.

G. R.

London, April 5, 1842

BOOKS ON GAS-LIGHTING.*

Some fifteen years ago, when gas-lighting was as yet but in its infancy, we remember to have had occasion (vol. viii., p. 307,) to find fault with the generality of the works then written upon it, as remarkable for a "disgraceful intermixture of quackery and false pretension;" and to have had subsequently a correspondence, of not the most pleasant character, with Mr. Thomas Snowdon Peckston, the author of "A Practical Treatise on Gas-lighting," respecting the extent to which he was entitled to exemption from this sweeping censure. (Same vol., pp. 341. 395. 414. 445.) We certainly did not think Mr. P. one of the quite exempt; but we might, at the same time, perhaps, have fairly conceded more merit to him than we then did.

That we were not more liberal of praise to Mr. Peckston was owing, in a great measure, to Mr. Peckston's own perverse blindness to the claims of others. He had greatly offended our sense of justice by attempting to wrest from Mr. Clegg the authorship of one of the most ingenious of his many useful inventions (the meter), and to disparage generally the importance of that gentleman's (still unrequited) services to the gas-light manufacture; though there is no person, nor, indeed, any number of persons who can be named, to whom it is more extensively and lastingly indebted; and as we could not recommend his work without assisting to give currency to its very false and ungenerous views on these points, we were at no pains to ascertain what its merits might be in other respects. It had one great blot in our eyes, which prevented our seeing any thing else.

The work now makes its appearance before us again, after the lapse of many years, in the form of a new edition (the third); and vastly the better for the correcting hand of time. Mr. Peckston has lived to feel conscious of most, if not all the injustice of which he was guilty towards Mr. Clegg. He still persists in claiming for another (Mr. Malam, his brother-in-law,) the invention of the meter (of which more by and by); and in no place speaks of Mr. Clegg with perfect cordiality of approbation. But he does now admit, in point of fact, though usually in a reluctant, and sometimes in a most ungracious tone, that Mr. Clegg is without a compeer in this branch of art. "The preponderance of his claims to notice over those of others is undeniable." p. 93. Mr. Peckston has, besides, lived to know himself a great deal more of the art of gas-lighting than he did when he first wrote about it. He has, it appears, been ever since practically engaged, with but little intermission, in the designing and erecting of gas-works in different parts of the three kingdoms (Preface); and while thus gathering many new lights from his own practice, has not been an inattentive or unprofiting observer of the practice of others. What, therefore, was originally but the slender work of a very slender novice, has now grown, in the course of years, into the well-filled treasury of a man of extensive experience and approved talent. Indeed we may say, that what with rectifying those parts which were erroneous—expunging such as have become obsolete, or were never much to the purpose—amplifying others that were exhibited but in outline—and adding the many new inventions and improvements which the last 15 years have produced—Mr. Peckston's treatise has become, under his hands, quite a new book; and a good book too, which, in spite of the taint of personal prejudice, of which we have before spoken, and of two or three other serious exceptions, to be presently noticed, will be found of great practical value to all concerned, either as engineers, manufacturers, or consumers, in the gas-light manufacture.

It is a curious coincidence, that the same year which has witnessed Mr. Peckston's re-appearance as an author before the public, should have produced a powerful competitor to him in that capacity, in the son of the very Mr. Clegg whose merits Mr. Peckstone has been so tardy in recognizing, and to whom he still makes such imperfect amends. If it be, as we suspect, that a natural de-

* A Practical Treatise on Gas-Lighting. Third Edition, carefully corrected, and adapted to the present improved State of the Manufacture of Gas. By Thomas S. Peckston, R. N., Civil Engineer. 8vo, pp. 172. With Twenty-two Plates. Hebert, London.

A Practical Treatise on the Manufacture and Distribution of Coal Gas, its Introduction and progressive Improvement. Illustrated by Engravings from Working Drawings, with General Estimates. By Samuel Clegg, Jun., C.E. 4to, pp. 208. Weale.

sire of vindicating a father's fame has had a principal share in making an author of the son, Mr. Peckston may read in this fact a valuable lesson on the advantage, in the long run, of even-handed justice.

But the "Practical Treatise" of Mr. Clegg, jun. (for, as if more peremptorily to challenge comparison, he adopts the same title as Mr. Peckston) is no family affair. There is, in truth, much less of the son in the one book, than there is of the brother-in-law in the other. To write a complete and true history of the rise and progress of the gas-light manufacture, without making more frequent and prominent mention of Mr. Clegg than any other person, is, for the reasons before stated, impossible; and such a history is simply what Mr. Clegg, jun., has achieved, with far less indulgence in language of praise towards the chief actor in it, than might have been expected, and would readily have been excused. Anxiety to place the services of a near relation fairly before the public, has not prevented *him* from doing everywhere full justice to the claims of others. He has enjoyed, he tells us, "access to, and the free use of, his father's manuscripts and notes—the result of his long labours and experience in this department of engineering;" and so far he has had greatly the advantage over Mr. Peckston and every other writer on the subject. Mr. Peckston's experience dates no farther back than about twenty years, but that of Mr. Clegg, sen., embraces twice twenty years—goes back, in fact, to the very origin of lighting by gas. Mr. Clegg, jun., has brought, besides, to the execution of his task, talents and attainments of his own of no mean order; some considerable experience, too, acquired under the immediate eye and fostering care of the Nestor of the art; and of these personal qualifications the volume before us exhibits many pleasing proofs.

The early history of gas-lighting is related much in the same way in both Treatises; and is, in its general features, familiar to most readers. The following incidents, which we quote from the Clegg treatise, we do not remember to to have met with before:—

SIR HUMPHREY DAVY ON GASOMETERS.

"The great prejudice entertained against the introduction of gas-lighting, not only by the public, but also by men of science, seemed at one time to present an insurmountable obstacle to its further progress. Lighting a town with gas was still thought a visionary scheme. Sir Humphrey Davy considered the idea so ridiculous, that he asked "if it were intended to take the dome of St. Paul's for a gasometer?" to which Mr. Clegg replied, that he hoped to see the day when gasometers would not be much less. They are now (1841) made 100 feet diameter, and 39 feet deep."

ROYAL SOCIETY SCIENCE AND WISDOM.

"After the works at Peter-street had been some time in operation, Sir Joseph Banks and several other members of the Royal Society were deputed to examine and report upon the gas apparatus. The deputation strongly recommended Government to oblige the Company to employ gasometers embracing not more than 6,000 cubic feet, *secured in strong buildings*. As Sir Joseph Banks, and some of the other members of the deputation were considering on the danger of a leak in the gasometer if a light happened to be near, Mr. Clegg called to a man, desiring him to bring a pick-axe and candle; he then struck a hole in the side of the vessel, and applied the light to the issuing gas, to the no small alarm of all present, most of whom quickly retreated; contrary to their expectation, no explosion resulted from the experiment. This practical proof, however, did not seem to convince them of their error, and the Chartered Gas Company was put to considerable expense in making small gasometers surrounded by strong buildings."

DIFFICULTIES IN PUSHING A NEW TRADE.

"The Chartered Gas Company at first fitted up and supplied shops and houses with gas *free of expense*, in order to induce others to adopt the plan; so things went on for nearly two years, with only a few retorts in action.

* * * *

"On the 31st of December, 1813, Westminster Bridge was lighted with gas. The lamplighters were much startled with the new system, and refused to act, and Mr. Clegg had himself to light the lamps for a few nights.

* * * *

"When gas lighting was first brought into use, no proper chandeliers, brackets, stopcocks, &c., for the fitting up of shops, were to be found; no one was willing to embrace their manufacture, considering it as a hopeless scheme; Mr. Dixon was the first to begin."

THE SECRET OF THE FIRING OF THE PAGODA IN ST. JAMES'S PARK.

"On the occasion of the illumination for

the Peace of 1814, when the Allied Sovereigns visited England, the devices in gas lights far exceeded in splendour anything before or since exhibited; the principal illumination was a pagoda, erected by order of government in St. James's park. This pagoda was octagonal, composed of wood, eighty feet high, at each angle of which a perforated pipe was fixed; a projecting pipe was also placed at every angle of each story, in the form of a griffin's head, pierced with small holes, through which issued jets of gas. At the lowest orifice of each perpendicular pipe a small oil lamp was concealed, which, when lighted, ignited the first jet of gas; this communicated the light to the next jet, and soon to the summit. The burners of each angle were thus simultaneously ignited, and the gas light rose into the air with the majesty of a rocket; and the pagoda illuminated by more than 10,000 burners, was fired in a few seconds, the whole appearing like a mass of living light. This device was fortunately exhibited to the Prince Regent, and most of the royal family, at their request, on the night previous to the general illumination; their highnesses walked in Carlton-gardens to witness the effect, and expressed great approbation. The night on which this first grand display of gas lighting was to have been exhibited to the public, Sir William Congreve, contrary to Mr. Clegg's advice and request, insisted upon letting off fireworks from the pagoda, before the gas should be turned on; the consequence was, that the whole erection was burned to the ground. The accident was not only mortifying, on account of the expense and trouble incurred by the Gas Company in this affair, but still more unfortunate, as gas lighting had only been lately introduced, and all new schemes (as great improvements are generally called) have many enemies. A report was spread abroad the following day, that the gas had set fire to the pagoda; the public was never entirely undeceived."

The advantages of gas lighting, as contrasted with artificial light obtained from other sources, are very fully discussed in both Treatises. Mr. Peckston concludes a long chapter of directions for ascertaining the comparative illuminating power and cost of wax and tallow candles, wick lamps, and gas lamps, with a Table of results, from which it appears that when gas, at 9*s*. per thousand cubic feet, is burnt to the best advantage, which is in a fifteen hole argand, with a flame three feet in height, the comparison stands as follows:—One gas lamp supplies as much light for 4*l*. 2*s*. 2*d*. per annum as would cost 16*l*. if procured from tallow candles at 8*d*. per pound, or 43*l*. 10*s*. if from wax, at 2*s*. 6*d*., or 15*l*. 15*s*. if from sperm oil at 9*s*. per gallon. Mr. Clegg's estimates differ considerably from these, which apparently arises, in the first place, from his making allowance for the increase of illuminating effect consequent on any increase in the specific gravity of the gas—a very necessary element in the calculation, but not taken into account by Mr. Peckston in his Comparative Table, though made the subject of a special notice towards the end of his work, (as if it had been an afterthought;) and, secondly, from his adopting higher rates of cost for the gas, and lower for the contrasted articles than Mr. Peckston has done. Mr. Clegg's estimate is that 6,000 cubic feet of coal gas of the specific gravity ·400, when supplied with a sufficient volume of oxygen for its complete combustion, is equal to the light from 2,400 candles, eight in the pound; and that the difference in favour of the gas at 12*s*. the 1,000 cubic feet, (a high rate,) is compared with tallow candles at 6½*d*. per lb., (a low rate,) as 15*s*. 1*d*. to 27*s*. 1*d*.

It seems to be agreed that coal gas cannot be manufactured with economy by means of any apparatus at present known *on a small scale*. The point of economy does not, however, descend so low but that every town in the kingdom without exception, might be lighted with gas at a profit. Mr. Clegg gives a statement of the outgoings and receipts of a country gas establishment for 64 public and 72 private lamps, which exhibits an annual profit of no less than 191*l*. 7*s*. 10*d*. The inducement to erect such establishments is the greater that there is no variableness in the results—no chance of loss one year to be set off against the profits of another.

"Upon a well-regulated system, the cost of producing every 1,000 cubic feet of gas with the same coal, will not vary one penny the whole year round; the quantity of gas made will be adequate to the demand, and no more. The wear and tear of the machinery will be exactly that which was anticipated, and therefore the annual outlay will be known; the sale of the products of the establishment may be depended upon with equal certainty, and the income, with the profit arising from the difference, is thus obtained."—*Clegg*.

"The price of coals can exert but little influence upon the price of the gas produced from them, for where coals are plentiful it

follows that they will be cheap, and hence also will be the coke produced therefrom; but where coals are dear, the coke will also sell for a higher price, and find a more ready market."—*Peckston.*

In the early days of gas-lighting, the quantity of gas obtained from the distillation of a ton of coal did not much exceed 6,000 cubic feet, by the consumption of half a ton of coal for heating the retorts, but so great have been the progressive improvements in this branch of the art, that the product per ton is now seldom less than 9,000 cubic feet, and amounts frequently to much more; while the fuel expended on the carbonization has been reduced from 50 to 25, and in some cases to as low even as 16 per cent. Among these improvements, the principal have been, a reduction in the size of he retorts from 20 inches to 12 and 10 in diameter, so as to admit of the coal being carbonized in thin layers—the substitution for circular retorts, of retorts of a form more or less approaching to the semicircular—and the setting of these retorts, of whatever form in ovens, instead of subjecting them to the direct action of the fire. Mr. Peckston gives the preference to retorts of an elliptical form over all others, and there was a time when he claimed the invention of that form for his friend Mr. Malam, though in his present edition he does not once mention Mr. Malam's name in connexion with it. Mr. Clegg seems to prefer the D-shaped retorts, but not very decidedly, and with a disingenuousness, which is unusual with him (indeed this is almost the only instance of the sort we have observed,) does not once notice the elliptical.

According to Mr. Peckstone, there is a saving of 2,806*l.* to be realized on the production of 44,598,684 cubic feet of gas per annum by the adoption of elliptical retorts; and this is advantage enough, to entitle the data on which it is founded to the most attentive examination.

Retorts made of *fire-clay* instead of *iron*, have been adopted. Mr. Peckston says they "were thought likely to be very durable, and also to produce very extraordinary results; but on being tried they were found neither to possess durability, nor to effect any other advantages over cast iron retorts of the same shape and size:" and with these general observations he dismisses them to the lumber-room of oblivion. The reader (not conversant with gas-lighting statistics) will be surprised when we tell him that the fire clay retorts thus contemptuously disposed of by Mr. Peckston, have superseded the use of metal retorts in no less than forty towns in England and Scotland—that in some instances, they have lasted for the extraordinary period of twelve years (which is just about twelve times the duration of iron retorts), that at the gas-works in Cambridge there are fire clay retorts which have been in operation for upwards of seven years, and are now in as sound and efficient a state as on the first day they were set to work; and that besides being so exceedingly durable, they produce more gas from a given quantity of coal. Mr. Peckston's statement on this head is in every particular, in fact, in direct and most unaccountable opposition to the truth. The causes of the superiority of the fire clay retorts will be found explained in the following extracts from Mr. Clegg's Treatise:

"It appears that clay retorts have great power to *retain* their heat, when brought to the proper temperature for decomposing the coal, viz. 27° of Wedgewood, and the introduction of a fresh charge is not nearly so much felt by them as by metal. This is a *practical* point—one which I have been at much pains to ascertain, and which I would not state were I not convinced of its correctness by personal observation. Mr. Grafton, the inventor and patentee, afforded me every facility for experiments, and is willing to do so to all who have a desire to test his retorts. This power of retaining heat is proved by constant practice to produce 1,000 cubic feet of gas per ton from the same coal more than the average of the London produce, and the consumption of fuel is not more than 22 or 23lbs. of coke to carbonize 100lbs. of Newcastle coal, taking the average of six months' working; it is even less with the Staffordshire or Lancashire coal. When properly constructed, these retorts are not in any degree liable to fracture, or to the escape of gas, but are of such strength as to resist the greatest pressure which is likely to be put upon them. The coke, also, made by them is also considerably of better quality, and produces less breeze or waste. The advantages of the fire clay retorts, combined with their great durability, will ere long be generally acknowledged and their use will consequently be more extensive."

The gas, after it leaves the retorts, has

to undergo several processes of purification before it is fit for use; of which the most important is the passing it through lime more or less slaked with water, in order to free it from the sulphuretted hydrogen with which it is always largely intermixed. Mr. Peckston states, "that when coal gas was first employed for the purpose of procuring light, it was allowed to proceed to the place where it was intended to be burnt, without undergoing any purifying process other than passing it through water; and *it appears that some time elapsed* before lime and water were used as a purifying medium." (p. 233.) Mr Clegg, he elsewhere says, "*put up* the first purifier." (p. 93.) We regret to have here again occasion to find fault with Mr. Peckston for grossly offending (from ignorance it can hardly be) against the truth of history. The first gas apparatus ever erected (1805) was that at the cotton mill of Mr. Henry Lodge, of Sowerby Bridge, near Halifax; the second, that of Messrs. Phillips and Lee, of Manchester (1805); the third, one for lighting the private residence of Mr. Lodge (1806); the fourth, Messrs. Knight's, of Longsight (1809), the fifth, Mr. Harris's, of Coventry (1809); and the sixth, that of the Catholic College of Stonyhurst (1811); the whole of which were erected by Mr. Clegg, with the exception of the second, which was erected by Mr. Murdoch, who had, by some previous experiments on a small scale, at the Soho manufactory, demonstrated for the first time the practicability of lighting by gas, and acquired thereby a just title to be regarded throughout all time as the father, or inventor, of gas-light illumination. Now, in the third of these cases, it was attempted to purify the gas by introducing lime into the tank of the gasometer; in the fifth, a paddle was added, to agitate the lime; and in the sixth, the gas was passed through a separate vessel filled with lime water, previous to its entering the gasometer,—the mode of purification which has continued to be followed, with but little variation, to the present day. The "some time," therefore, which Mr. Peckston tells us, "elapsed before lime and water were used," amounts, as nearly as possible, to just no time at all; for Mr. Clegg made use of it in the very second apparatus he ever erected, which was within less than a year of the first; and there were not in all more than two sets erected without such an appendage—Mr. Clegg's first, and Mr. Murdoch's first. Nor did Mr. Clegg merely "*put up* the first purifier," as Mr. Peckston, with most ungenerous stintedness of phrase, relates; he was the true and first inventor of the thing; he instantly perceived that without purification there was to be no progress made in the application of coal gas to purposes of illumination; and almost as instantly, by the resources of his very inventive genius, overcame it.

Mr. Peckston is not, we regret to say, the only individual at whose hands the claims of Mr. Clegg, in respect of this invention, have been unfairly slighted. In 1808, Dr. Henry communicated to the Royal Society a paper, in which he described the application of lime water, on a large scale, for the purification of gas from sulphuretted hydrogen, as a contrivance of his own; though, as we have seen, it had been reduced to practice by Mr. Clegg two years before; and Dr. Henry appears, from circumstances stated by Mr. Clegg, jun., to have been well aware of this fact.

We come now to the invention of the meter, by which the gas, after it has been made fit for consumption, is measured out to the consumers. The long standing dispute between Mr. Clegg and Mr. Malam (or rather Peckston *pro* Malam) on this subject, is now reduced by admissions on both sides to so narrow a point, that there is happily little left for us to do, beyond recording the agreement at which the disputants have arrived. "Some one may say," quoth Mr. Peckston, "that Mr. Malam only invented the L pipe and receiving chamber; *be it so*; if that be admitted, the rest follows, for the former completely changed the mode of entrance of the gas into the meter, and removed the great obstacle to the action of such an instrument." p. 367. "The merit," says Mr. Clegg, jun., with admirable candour (under all the circumstances,) "of applying a pipe on one side of the axis to convey the gas into the meter, *is due to Mr. Malam*—decidedly the most important improvement since its invention." p. 22. Nothing could be more distinct or unreserved than these reciprocal admissions, that Mr. Malam but improved what Mr. Clegg invented; yet it will hardly be believed that, in spite of Mr. Peckston's "be it so," he is not content that it should rest so; for he still persists every

where else in speaking of Mr. Malam as "*the inventor* of the gas meter," not the improver of it; and in order that a due share of solemnity might not be wanting to crown this intolerable inconsistency, he gravely adds, "we do so under the most perfect conviction that we are correct!"

A word or two before we leave this subject on the conduct observed towards Mr. Clegg and Mr. Malam, by that very sapient and eminently useful and respected body, the Society of Arts. In the summer of 1838, Mr. Clegg sent to that Society an account of his then still novel experiments in gas lighting, and the sages of the Adelphi, in order to testify to all future generations, how sensibly alive they were to the vast importance of the new art—how grateful to its most assiduous and successful, if not earliest cultivator—and how munificently liberal of encouragement to perseverance, awarded to Mr. Clegg their *silver* medal! But when, fourteen years afterwards, Mr. Malam presented himself to their notice as the inventor of the meter, which it is now established, past all dispute, he only improved—with this feather in his cap, snatched from the plume of his early master and preceptor, (Mr. Malam was originally a draughtsman in Mr. Clegg's office,) the Society, with the same magnanimous regard for the claims of genius, and the interests of science, which they had before displayed—with the same keen solicitude to show how well qualified they were (as every one knows they still are,) to sit in judgment on matters of this high import, awarded to the pretender-pupil for his single borrowed feather, the highest mark of approval in their power to bestow, namely, their *gold* medal! Who can but wonder that so nice a society as this should ever have fallen into decay?

The "Distribution of gas through Mains" forms the subject of an excellent and most useful chapter in the Clegg Treatise, but it is only very partially treated of in that of Mr. Peckston. It includes a set of "Tables of the different quantities of coal gas of the specific gravity ·420, delivered in one hour from horizontal pipes of different diameters and lengths, and under different pressures," which will be found of great practical value to all gas establishments. It appears to be well ascertained that the quantities of gas of any given specific gravity, discharged in equal times by horizontal pipes of different lengths, under the same pressure, are to one another in the inverse ratio of the square roots of the lengths; and also that the obstruction to the flow of gas through pipes is very nearly as the number of bends—two semicircular bends, for example, making twice the difference, three bends three times, and so on.

For regulating the flow of gas at the point of inflammation, both Treatises agree in recommending Platow's double cone burner as the most efficient. "This arrangement causes the light produced to burn steadily, and renders it very soft and agreeable. A saving of gas is effected by its use, amounting to about 10 per cent., whilst the heat generated, thereby is proportionably less than when the common Argand burner is used."—*Peckston.* "This description of burner is by far the best Argand, and should be universally adopted."—*Clegg.*

The "Secondary Products" of gas establishments, as coke, coal tar, ammoniacal liquor, naphtha, &c., are more sparingly treated of by both writers, than their importance in an economical point of view demanded. We quote from Mr. Clegg's Treatise the following notice of an application of the naphtha, lately discovered by the ingenious Mr. Lowe, which seems to promise very important results.

Naphthalizing Coal Gas.

"If coal gas is conducted through naphtha before being burned, the light is increased in brilliancy more than 50 per cent. I witnessed an experiment on this at Mr. Lowe's house, a few weeks ago, and certainly the effect was dazzling. The naphtha was contained in a sponge placed in an air-tight cap or vase below the burner. Mr. Lowe has also obtained this increase of illuminating power by filling the meter with naphtha, and thus describes his method:—

"As it regards the first part of the same, or increasing the illuminating power of such coal gas as is usually produced in gas works by impregnating such gas with naphtha, commonly called spirit of coal tar, or with any other volatile hydro-carbonaceous liquid: the method I adopt for so impregnating the said gas, is by merely filling the case of the common gas meter to the usual height, with any of the said liquids instead of water, by which means the said gas discharged by the meter to the burners is during the operation of measuring, sufficiently impregnated with the said liquid in the meter case"

Neither Mr. Peckston nor Mr. Clegg take the least notice of Mr, Gurney and

his Bude Light; and we must confess that we are not a little surprised at the omission. We believe its merits have been greatly overrated; but be this as it may, considering that it has engaged so much of parliamentary and public attention, and has been preferred before all others for lighting the Hall of the Collective Wisdom of the country, these facts ought to have sufficed to procure for it a prominent place in works professing to give a complete history of gas-lighting in all its more important practical applications.

INSTRUMENT FOR DRAWING ELLIPSES AND OVALS.

Sir,—Having contrived an instrument for drawing regular ellipses and ovals, or egg shapes, which I find answers the purpose extremely well, I send you a drawing and description of it, in the hope you may deem it worthy of a place in your Magazine.

Your correspondent, "H. P.," would oblige by giving his opinion as to the nature of the curves traced by this instrument, which I believe will be found very useful, as it is quickly set and very easily used.

I am, Sir, yours respectfully,

Samuel Milbourne.

Charles-street, Middlesex Hospital, London.

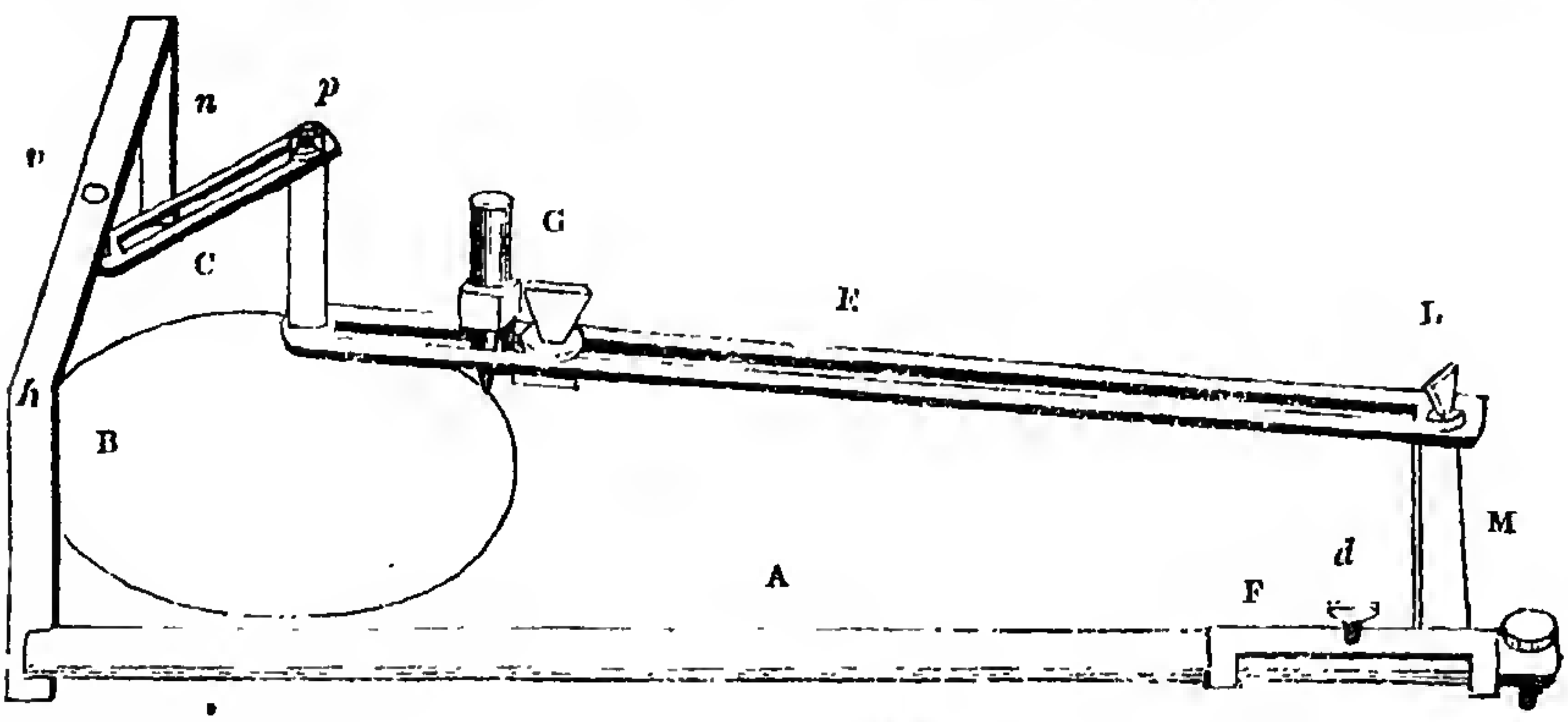
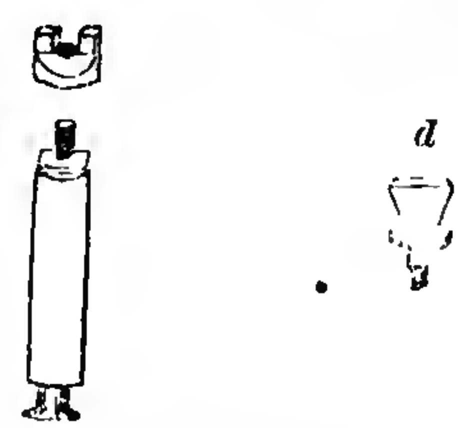


Fig. 2.

Fig. 3.



Description.

A is a round bar of steel, 12 inches long by ¼ inch thick, having a flat bar B, brazed on it send *r*, and bent twice at right angles, so that its feet *n* and *o* may rest on the drawing paper. To the centre of B the revolving bar C is so riveted as to allow the nut *p* to pass under B without touching. The cylindrical piece D is riveted so as to turn freely in the end of the tracing bar E, its upper end being shouldered and tapped, so that it can be fixed to any part of C by means of the nut *p*. F is a piece of brass tube, which slides freely on the bar A. To F is brazed the arm M, which carries one end of the tracing bar E always in a straight line parallel with the bar A; and the other end of E being carried in a circular path by the bar C, all points along the middle of E between D and the screw *d*, will move in an eliptic path; the situation of D on the bar C determining the length of the major axis, and the situation of the pencil on E determining the minor axis of the ellipse. Thus, the major and minor axes of an ellipse may be varied in any degree by varying the positions of D and C, and of the tracer on E. If egg-shapes are required, take out the screw *d*, and slide the tube F anywhere to the left on the bar A, and fix it there by the screw *k*;

then put the screw *d* through the groove in the bar E (instead of through the hole on its end as before,) and into the tapped end of M again.

The figures now traced by the pencil will be egg-shapes, whose major and minor axes, and the relative proportions of their broad and narrow ends may be varied in any degree by varying the positions of D and C, of the tracer on E, and of the tube F on the bar A.

G is the tracer holder (shown separately in fig. 2; a detached view of the cylindrical piece D is also given in fig. 3.). L is a screw for raising the bar A off the paper to allow the tube F to slide freely on A. The horizontal length from the angle *h*, to the centre of the rivet *v*, must be equal to the length of M between the centre of the screw *d*, and the axis of the bar A.

DR. NORMANDY'S SOAP PROCESS.

Sir,—My attention having been called to a paragraph concerning a patent of mine, published in your Magazine of the 30th ultimo, page 343, signed "A Shaver," I have perused it carefully. Coming, however, as it does, from one who avows that "he is not much of a chemist, and certainly never was a manufacturer of soap," I might have allowed it to pass unnoticed, were it not probable that by so doing the public, who read your Magazine, might be prejudiced against my plan, and assume that this "Shaver's" opinion and statements are correct, because they had not been contradicted.

The conclusion which the "Shaver" arrives at,—namely, "that it does not require a great deal of chemical knowledge or of manufacturing practice to see that these alleged improvements are altogether fallacious," betrays at once a presumption and an injustice which might well lead me to impute sinister intentions to the writer; I am, however, willing to believe that ignorance alone may be the cause.

If "A Shaver" had tried the only fair test left open to him, lacking both chemical and practical knowledge, and used the soap, methinks he would not have been so ready to condemn it. For his information, however, allow me to say, that both chemically and physically my method is a decided improvement upon the ordinary plan, not a "useless addition," as he is pleased to call it; and I have yet to learn that a mode of making a better article from cheaper materials is a fraud. If (even at the same price as others) I offer the public a better soap, that is, a soap possessing greater durability in water, increased cleansing properties, a soap that will retain its full weight, instead of losing ten or twelve per cent., as all other soaps do by keeping, it seems to me that I confer a benefit, not practise a fraud.

I could easily prove, chemically, that the union of the salts of soda and of potash with soap, as described in my process, gives it a great advantage over other soaps, and answers a purpose of saving and economy both to the manufacturer and to the purchaser, to an amount not to be attained by any other means at present known; but as "a Shaver in *business*" (that is, I presume, a barber) knows little of chemistry, and nothing of soap-making, let him try it on his customers' chins; or if, deficient also in shaving skill, they, knowing it, will not permit him, let him perform the experiment on his own, and then he may, perhaps, favour us with an account of the result.

In the mean time I remain, Sir,
Yours very respectfuly,
A. L. M. DE NORMANDY, M.D.

Soap Factory, 11, Gloucester-terrace,
New Road, Whitechapel, May 12, 1812.

ABOLITION OF THE CLIMBING-BOY SYSTEM—HINTS ON CLEANING CHIMNEYS BY MACHINERY.

Sir,—As the new Act respecting the sweeping of chimneys will so shortly be in operation, it is time that all persons turn their attention to making such new arrangements in their flues, where it may be required, as will enable them to be cleaned by machinery.

In considering this subject, it has occurred to me that a new mode of cleaning chimneys might be adopted, that would prevent the necessity of any alterations; but I speak with diffidence on an untried subject: I will, however, venture to throw out the hint in your valuable Journal; and in time, perhaps, it may be ripened into use.

Most flues have from a square foot to a foot and a half of area in their cross

section; and if 60 feet high, will contain a body of air of from 60 to 90 cubical feet. I propose, by a very well known process, to give this body of air, from below, the velocity of our greatest tempests, which are found sometimes competent to remove the chimney, much more the soot.

Air, at 100 feet per second, exercises a force of 25lbs. on the square foot; and would, therefore, if not found sufficient to clear away soot alone, readily force such elastic whalebone brushes, or other matters, through the flue as may be found necessary to loosen it from the bricks, when it will be blown out.

It would be a nuisance to blow the soot out of the top of a chimney in towns; hence, in this case, the top of the chimney should be fitted with a large bag reservoir, that will contain more cubic feet of air than the chimney, and the blast must be stopped when this is filled. The soot must be left to settle for a few seconds; the air let out at a flap valve, like that of an organ bellows, and the operation repeated as often as required. A spherical bag, ten feet in diameter, will contain above 500 square feet.

A sort of parasol, made of strong canvass and cane, may be used for driving the brushes; and these may have a few light wooden wheels to guide them where flues bend much.

A man can exert the ordinary force of two horses for a few seconds; and by so constructing the ordinary centrifugal bellows that several men can apply their strength readily to it, it appears that the velocity of 100 feet per second can be commanded by multiplying wheels in the usual way.

It will be necessary to have the front openings to the chimney well secured by an expanding frame and strong air-tight cloth, and also any others that communicate with it.

I am, Sir, yours, &c.
G. C.

THE PARIS RAILWAY ACCIDENT—MORE VICTIMS TO MISMANAGEMENT.

The Paris and Versailles Railway has been the scene of one of the most tragical disasters which has yet occurred in the history of railways. Two *four-wheeled* engines were drawing, at a great velocity, a train of eighteen passenger carriages—the axletree of the first broke, and down it fell—the second ran over the first and crushed it to pieces—the second was in its turn run over by three of the carriages immediately behind it, each rising over the other—and in an instant engines, drivers, carriages, passengers, were all mingled together in one horrid heap of destruction. An instant more, and the heap was on fire from the burning coals scattered by the engine furnaces! Of those who escaped immediate death, all who were so maimed as to be unable to move, only survived for a few minutes to perish more awfully by the flames. And still more sad to say, there were in all probability not a few left, with limbs unbroken, and with strength sufficient (if strength would have sufficed) to save themselves, but who were prevented from escaping by the practice of making fast the doors of railway carriages—literally tied to the stake, in fact, and burnt there to ashes, martyrs at once to railway mismanagement and railway discipline.

The number of the sufferers by this awful calamity has not yet been accurately ascertained. According to some estimates not fewer than one hundred persons were killed, and some sixty or seventy wounded, (including those in the carriages in the rear who suffered from the severe shock given to the entire train); according to others the loss of life was considerably less—according to all it was enormous.

The Academy of Sciences immedistely held a meeting to enquire into the accident, when a Report upon it was read by MM. Combes and Senarmont, engineers, which assigns it to the following causes:

"The accident is due to a fatal concurrence of circumstances, *which are all so many gross faults, easy to have been foreseen, and still more easy to have been avoided*, so that the future prosperity of railroad companies is by no means compromised by this sad affair.

"The *first* cause of the accident was the employment of a locomotive with *four wheels*. It is essential that every carriage intended for service on a railroad, should rest on six wheels at least, in order that if one of the axles should break, the carriage

should still rest on supporters, and continue its course.

"The *second* fault consists in the employment of two locomotives for a single train. The consequences of this arrangement are self-evident.

"A *third* circumstance is the precaution taken to lock the doors of the wagons, so that in such a case as that which occurred all escape was prevented, and the travellers were condemned to suffer all the consequences of the first accident.

"A *fourth* cause which had much influence on the catastrophe, was the neglect to isolate the train from the locomotive, so as to prevent the shock occasioned by the sudden check to the speed with which they were proceeding.

"It is worthy of remark, that if all those causes had not existed together, and if only a single precaution had been taken, the accident would not have happened. If the first engine had been furnished with six wheels when its axle broke, it would not have lost its equilibrium. If a second locomotive had not been employed, the only consequence of the accident would have been a shock; and even admitting that the two first causes of the accident existed, had the doors of the wagons not been locked, a number of the passengers might have escaped the flames. In fine, the interposition of the buffer system would have saved the train, even if no other precaution had been observed."

It will be in the recollection of the readers of our journal, that the danger to be apprehended from each of these causes, with the exception of the third, has been repeatedly pointed out in its pages, (as well as in those of several of our English contemporaries;) so that it is not merely *want of foresight*, as the authors of this Report represent, which we have on the present occession to lament, but a culpable persistance in practices which the voice of science has long since condemned. The French engineers, it is true, have still the authority of English example to plead in extenuation, for the same practices which have led to this disaster on the Paris and Versailles Railway, prevail on some of the most important of our own railways; but there is also much good English example to the contrary—on the four wheel point, at least, if not on others. It would be well, however, for humanity, if the engineers of both countries would heed example or fashion less, and take counsel of common sense and experience more. No authority, however long standing or eminent, can excuse adherence to such palpable blunders in mechanical construction and disposition, as the preference of four wheels to six, the employment of two engines to draw one train, and the attaching of the passenger carriages immediately to the engines, without any buffing apparatus or other means of protection between. (We say nothing at present of the locking of the doors, for that is a point on which there is much, we apprehend, to be said on both sides.) Neither ought any past exemption from accident—even though it were twice as great as the managers of our London and Birmingham line boast of as *their* excuse for doing nothing—to be urged as a reason for delaying one hour the rectification of these blunders. The accident which has just filled all Paris with consternation and sorrow, *may be repeated on some of our own lines to-morrow*. There is nothing whatever in their arrangements to prevent it; nothing to make breaking of axles, and engines running foul of one another, and upsetting of fire-boxes, less likely to happen, or happening, less likely to produce extensively fatal consequences, on the one side of the Channel than on the other.

We should not wonder, if notwithstanding all that has passed and all that has been said, the adoption of a more improved system of railway transit were still to have considerable opposition to encounter—at the hands especially of those who have set themselves up as the pen and ink champions of things as they are (for what so obstinate as the vanity of a little learning?)—but we shall wonder greatly if the good sense of society bear much longer with the apathy of railway proprietors, or the empty babble of their apologists.* It is high time

* The most inveterate scribbler of them all is a pestilent Ironmonger, who on the same principle that the poker and tongs may be supposed to know something of the chemical principles of combustion, because their station is near the fire-place, ima-

to be done with prating about the safety *of existing practices, when people are smashed to death by them in scores and hundreds.*

We conclude by earnestly inviting the attention of our readers to the very sensible and impressive letter which follows, on the subject, from Sir George Cayley, to whom the public are already indebted for a very able ***Essay on the prevention of Railway Accidents***, as well as many valuable practical suggestions for the purpose, and whose opinions have the recommendation of being not only those of a gentleman of well deserved eminence in the scientific world, but of one whose rank in society gives assurance of their being promulgated solely with a view to the public good.

ON THE LATE ACCIDENT ON THE PARIS AND VERSAILLES RAILWAY.—BY SIR GEORGE CAYLEY, BART.

SIR,—It is obvious that if some more efficient precautions respecting railway conveyance than those at present in use be not adopted, we shall be subject occasionally to such sweeping and horrible catastrophes as have occurred near Paris, in which, at one fell swoop, from 80 to 100 persons have been killed under circumstances too shocking to dwell upon; for of those who witnessed the miserable reality, several have been deprived of reason. But although we may choose to avoid allowing our imaginations to particularize these horrors; yet it will not permit us to draw a veil over the broad fact that when we travel per railway, we place ourselves within the range of a similar result. This state of things has a twofold evil attending it; nervous and timid persons are absolutely prevented from using this mode of conveyance; and the great mass who venture upon *it, travel under a painful sense of the danger they incur. It is impossible perfectly to* exclude all risk from this or any other mode of conveyance; but it is equally absurd and wicked not to have the most rational means of preventing these accidents enforced upon the railway companies by law. Other modes of conveyance are nearly put down, and very soon none of her Majesty's liege subjects will be left any choice in their means of conveyance; and the question is, whether their lives are to be thus continued in jeopardy (when ready means are at hand to prevent it, or at least to reduce it within the ordinary chances of life and limb,) or that companies monopolizing the means of conveyance, are to be put to a reasonable expense in being compelled to adopt such means, as will prevent nine-tenths or ninety-nine-hundredths of these horrors? If Government be not permitted to interfere with private property, vested in these companies, for the purpose of protecting life, and that property is thus made to outweigh the value of life, it is full time that this noble invention should be taken entirely into the hands of the Government, and thus ripened into safety, clear from the mammon of money-making. To avoid expense, the companies are obliged to fence themselves round with every barrier to prevent the introduction of those improvements, which experience or invention has suggested; but it is in vain for these parties seriously to pretend that *all* these matters are visionary schemes and below their practical notice, though very possibly *many* may be so. I will put the case thus. It has been suggested over and over again, by many persons, and in various ways, that besides the usual buffers to each carriage, some general system of elastic matters should to a great extent intervene between the head of the train and any obstacle it may meet to stop its course; nothing can, to common practical sense, be more obvious than this; yet nothing has been done by railroad companies respecting such an arrangement which, in fact, would cure nine-tenths of the head and front of the offending.

However, this would not alone meet every case; let us take, for instance, that which has just occurred near Paris. Had some general system of buffers intervened between the engines and the head of the train of waggons, the accident would, it is

gines that he must know better than any body else how railways and railway carriages should be constructed, because his daily business is with iron bars, hoops, and faggots. It was this mischievous busy-body who either moved or seconded (we forget which) the memorable resolution of the Birmingham Railway Conference, (the *Masters'* Conference, we mean,) that none of the accidents which have occurred on railways, were in the slightest degree imputable to want of judgment or care on the part of Railway Directors! One of this gentleman's most recent exhibitions of ignorance was amusing. Not knowing the difference between *ascension* and *accension*, he mistook the one for the other, and wasted a ream of good *fools*cap in proving that a bubble of gas may mount into the air without being set fire to. If Master Shallow do not shift his quarters soon, the Thames will be in danger.

true, have been prevented; and the French suggest that, to answer this purpose in future, the first five or six wagons should remain empty to be ready for *smashing*, and to save those loaded in the rear. This is but a rude mode of effecting the purpose, but it points out the public opinion as to the general buffing principle, and ought to teach a lesson to railway directors. Had these general buffers, however, preceded the engines, they would not in this case have been efficient, as the broken axletree of the leading engine would still have upset the train. But had the engine been provided with six wheels, or been so constructed as to rest on a foot or sledge made to sustain the carriage on the rail, when any wheel may fail, as has long ago been suggested, then the catastrophe would have been prevented. These sledge feet accompanying every wheel, and suspended an inch above the rail, until the wheel breaks, ought to be a *sine quâ non* in all railway carriages; the cost would be trifling and the safety great.

It has also been suggested that there is no necessity for the train to take the same risk as the official parties working the engines, on whose conduct the safety mainly depends, and from whose neglect most accidents occur. The engine will pull the train with equal effect when a cord of from 50 to 150 yards intervenes; and this might be lengthened or shortened at pleasure to suit curvatures on the line by coiling it round a drum. Suppose a train of carriages to be so constructed that each carriage is furnished with a drag on its wheel, which is always in action, excepting when the tension of the cord from the engine becomes sufficient to give motion to the train, and lift the drags; in this case, so long as the engine continues on its course, it pulls the train freely after it without any friction from the drags; but, the instant the engine becomes stopped or upset, the drags are all at work, and the train is brought to rest in a few yards without overtaking the engine or any risk of accident. Some minor arrangements will be necessary in this mode of drawing trains; but the general features of the case are obvious enough, and may readily be brought into use.

It is not my object to go further into these matters at present than may be sufficient to point out how obviously common sense is at variance with railroad practice; and how essential it is that the former, pleading for life and limb, *versus* money and monopoly, should prevail. I do not blame the directors of railroad companies; they are placed in authority by parties subscribing their money with no other view but to make the most interest they can of it, and with their delegated authority, they could not appropriate any part of their funds to the mere charitable purpose of saving life. But this places them in a painful and false position as respects society at large, now that railroad conveyance has become the order of the day. Safety, it may be said, is ensured by its being one element in gaining passengers, but increasing monopoly of conveyance, leaves no choice, and whatever be the hazard, we must either rest stationary or take it; hence, the same profits arise to the companies whether they improve upon the means of safety or not.

Many excellent plans for signals have been invented, and want little to perfect them into the means of almost ensuring safety, from collision with trains or other obstacles. One especially, first suggested by Mr. Curtis, which ensures either one mile in advance of each signal post being totally free from obstacles—or if not free, erects the signal for danger night and day in immediate view of the approaching train.

These matters I have named, either *can*, or *cannot* be done; if they can, great safety will be the result; and I think the public has a right to know from first-rate engineering authority, clear from all interested parties, and by the test of experiment, under such authority, whether these or any better means can be applied to prevent the death's head and cross bones becoming the appropriate crest for railway carriages.

I am, Sir, your obedient servant,

George Cayley.

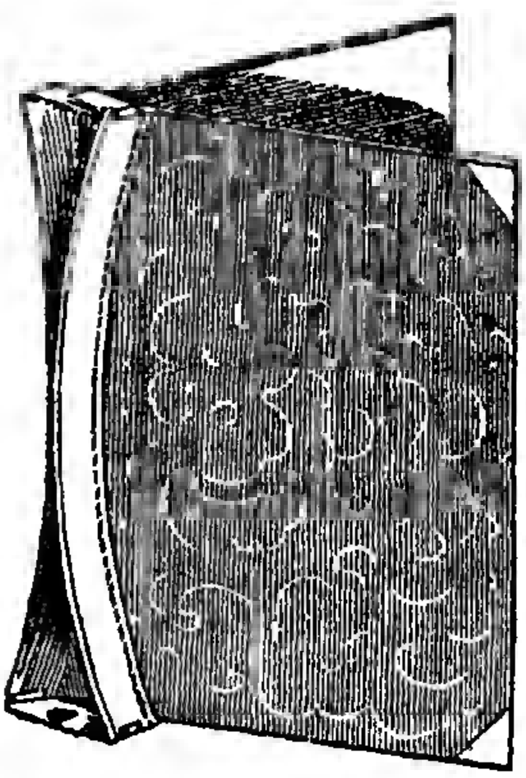
Brompton, May 13, 1842.

TYLER'S SPRING LEAF-HOLDER.

(Registered pursuant to Act of Parliament.)

Sir,—The readers of your Magazine, as of many other periodicals, have the choice of two evils, viz. either to wait till the end of the month for the numbers neatly stitched up into a *Part*, or to suffer an accumulation of loose leaves, liable to be soiled or lost, and inconvenient for reference.*

Both these states of things have been found so annoying as to lead to several attempts to remedy the evil, by the construction of *leaf-holders* of various kinds, one of which, at least, has been made the subject of a patent. Each of these contrivances has in use been found defective, some failing from one cause, some from another. A very simple leaf-holder has recently been introduced by Mr. Tyler of Sheffield,* which obviates most, if not all the faults of its predecessors. The accompanying sketch will illustrate the



nature of this contrivance, which consists of two curved steel springs enclosed in the leather part of two portfolios, or book covers; at the top and bottom of each spring is jointed a metal link-plate or clasp, by which the back may be adjusted to several thicknesses, as the quantity of its contents increases. The curved form of the springs causes the numbers, etc., placed between to be held very tightly, the greatest pressure beginning at the centre; and so perfect is the holding, that a single Bank note is held so tightly, as to make it impossible to withdraw it until the clasps are released.

In using this holder, the numbers or leaves are to be laid evenly upon one of the covers: the other cover is then placed over them, and the right-hand clasp hooked: the other end of the spring is then to be pressed down, and the other clasp fastened. The back of the volume thus formed being struck flat on the table, will bring all the backs of the numbers even.

Some persons have objected to the trouble attending the operation of inserting a number; but I suspect this objection only arises with individuals who are too idle in their habits even to collect their numbers together. "There are no gains without some small pains," is a trite proverb, and if people are too lazy to take any pains to keep their odd numbers in a compact and convenient form, they must be content to devote some of their gains to supply the deficiencies which are discovered in their volumes by the binder.

Mr. Tyler's simple, effectual, and durable leaf-holder, is admirably adapted for its intended purpose, and I have great pleasure in bearing testimony to the convenience which I have experienced from the use of several of them of various sizes.

Remaining, Sir,
Yours, respectfully,
WM. BADDELEY.

29, Alfred Street, Islington,
April 27th, 1842.

* Riddell and Meymott, London, Agents.

THE ALLEGED ADULTERATION OF ZINK.*

Office of the London Zink Works, 28, Martin's Lane, Cannon-street, May 12, 1842.

Sir,—In the *Mechanics' Magazine* of the 7th instant, No. 978, there is a communication from Mr. Mallet on the subject of zink, which I, as one largely engaged in the trade, feel compelled to answer, by saying, that as far as concerns the sheet zink, rolled at the London Zink Mills, not one particle of lead or any other metal is, or ever has been, mixed with the spelter there used. The crude metal is remelted and freed from

* We adopt the spelling of our present correspondent, Mr. Ball, which is the correct one. "The common orthography *zinc* is erroneous," *Webster's Johnson*. The word is borrowed from the German, in which it is spelt *zink*. The change into zinc is of French origin, and was owing, doubtless, to the natural dislike of our Gallic neighbours to the letter k, which, though used in kilogramme, kilometre, &c., is still only a sort of naturalized alien amongst them. So far as regards the noun substantive, the substitution of the c for k is of no consequence, and it is only when we begin to form other words from it, that the impropriety of departing from the original orthography is felt. *Zinced*, pronounced with the c soft, would be an intolerable offence against euphony, and therefore, we say *zincked*. The French get over the difficulty by having recourse to the barbarism *zingué*, which shows that they do not manage every thing better in France. Better to adhere to the original spelling all through, *zink*—to *zink*, *zinked*, *zinkography*, *zinkographer*, &c. ED. M. M.]

oxide and other impurities at no inconsiderable expense and loss, but nothing is ever added.

All the spelter received from the Continent contains lead or iron, and often both. On the average, however, I believe the proportion falls short of, rather than exceeds, one per cent. in all. Of the Belgian spelter I have had little experience, but I do not imagine it differs materially from the other kinds. Now that your above-mentioned correspondent should have met with any sheet zink containing from 20 to 33 per cent. of lead does seem to me most extraordinary! and as an adulteration of this sort is clearly a fraud, and must be mischievous, I hope Mr. Mallet will prosecute his inquiries, and withdraw his statement if further research lead him to a conviction that it is erroneous, or, in the contrary case, again warn the public against the vendors of such spurious merchandise.

I remain, Sir, your obedient servant,
JOHN BALL.

BUDDING'S GRASS-MOWING MACHINE IMPROVED.

In our 17th vol. p. 345, we gave an engraving and description of the Grass-mowing Machine in use at the Zoological Gardens, invented and patented by Mr. Budding. It has, we find, been since much improved upon by a Mr. Shanks, of Arbroath, at the suggestion, and under the direction of W. F. Lindsay Carnegie, Esq., of Kimblethmont, one of the most zealous and intelligent patrons of all new inventions and improvements, of whom Scotland can boast. The chief defect in the original machine was, that it was applicable to the shearing of small spaces only; the great merit of the improved machine is, that it will cut with facility pleasure grounds of any dimensions. We extract the following account of it from a communication by Mr. Carnegie to our popular and useful contemporary, the "Gardener's Chronicle."

"The accidental discovery that the patent had been taken for England only, led to my employing a very ingenious mechanic in my neighbourhood (Mr. Shanks, of Arbroath) to construct the implement I first used. His success was complete, and I have had the experience of a whole season to test it. My lawn (consisting of nearly 2½ acres) was cut weekly, all last year, by one man, aided by a small pony, in a style not to be surpassed, if equalled, by the best scythesman. The breadth commanded was 27 in., and about eight hours were expended in going over the whole. Two men could draw the machine easily; but finding the horse's feet, when working, (as answers best in dry weather,) left no permanent mark on the grass, I preferred the latter: it is guided by leading-reins. During the season no repairs of any kind were required; and I do not think that even sharpening will be necessary until after several years' repetition of similar work.

"This success suggested a further improvement with a view to economy, viz. the giving the machine weight enough to act as a roller, and, at the same time, increasing the cutting breadth. The new machine, which commands 42 inches, has been just tested, and its success surpasses my expectation. The lawn of 2½ acres is now cut, the grass swept up, and the ground effectually rolled by my gardener, assisted by the pony, in 2½ hours; and the execution, particularly where there is a good sward, leaves nothing to be desired. When the ground is much fogged, a surface is produced very similar to velvet.

"Mr. Shanks has added a revolving brush, for the purpose of better delivering into the cutters the grasses, which are found occasionally reclining horizontally: it works well, and enables a higher sward to be removed at one operation; but these cases are, or ought to be, of unfrequent occurrence: this apparatus is easily detached. The economy effected may be easily estimated by any one; I shall not, therefore, go into the detail of its calculation: it is simply the whole expense in labour of scything, minus the difference in interest of capital invested in the machine, and in roller, scythes, rakes, &c. I paid 18*l.* for the first machine; and I understand the cost of the new one (were there several to be made) would not much exceed 20*l.*; but for this I must refer parties to Mr. Shanks himself, who, in the present extraordinarily depressed state of the machine-making business, will, I doubt not, be but too happy to attend to any orders he may be favoured with. Looking to the accuracy of the execution, the weight of material, &c., I consider the price as lower than it could be done for in times of even ordinary prosperity. I ought to mention, that application may also be made to Mr. Ferraber, of Stroud, Gloucestershire, the agent for Mr. Budding, and an extensive maker of machinery. He came down here last year, and made himself acquainted with the details of the machine, and has, I believe, arranged with Mr. Shanks as regards the English patent."

NEW ARRANGEMENT FOR ELECTRO-MAGNETIC ENGINES.

Fig. 1.

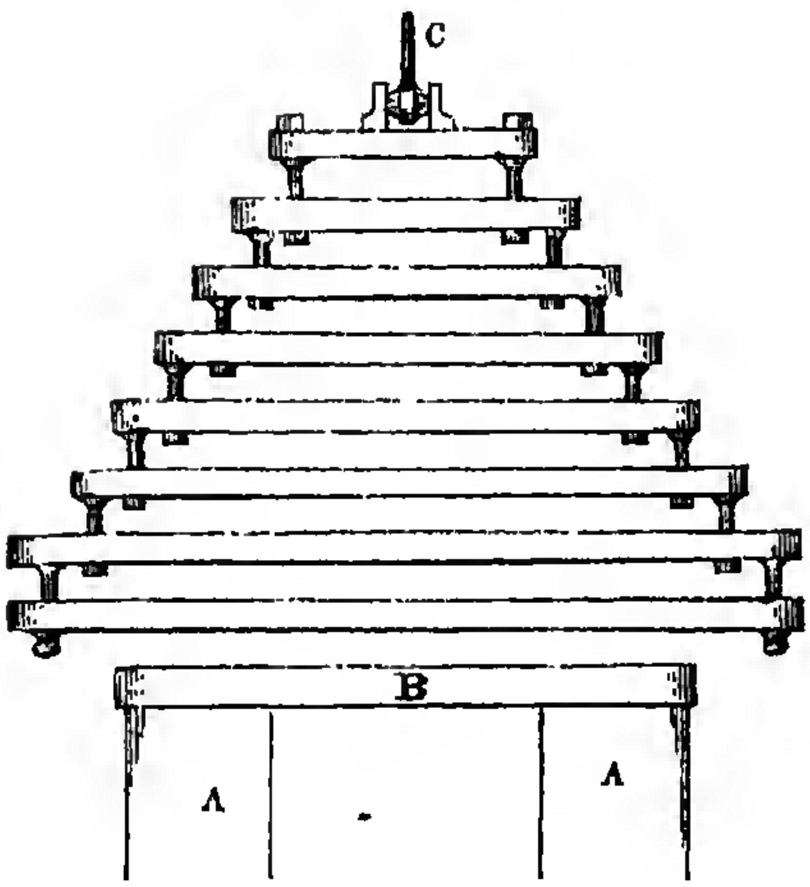
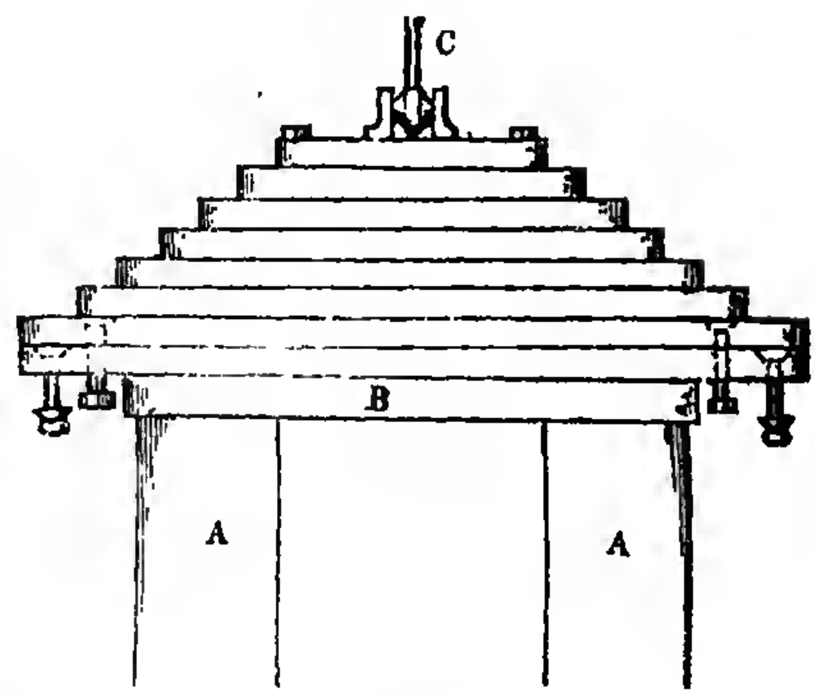


Fig. 2.



Sir,—Some time since I forwarded to you (signed with the initials W. H.,) a communication descriptive of a new arrangement for electro-magnetic engines, which you were so kind as to insert in No. 947 of your valuable journal. I have again to trespass upon your favour in order to notice some improvements which I have since effected in that arrangement.

The first is the substitution of the staple form of magnet for the straight bar. And the second consequent on the first, viz., breaking the circuit at the end of the stroke.

These alterations I have made in order to introduce the third improvement, which is, I believe, original, and of some importance, inasmuch as it may be applied to any electro-magnetic apparatus in which it may be necessary for the magnet to attract from a distance. By means of it any length of stroke may be obtained, and the power be more nearly equalized throughout the stroke.

The contrivance is shown in the accompanying diagrams, which represent the apparatus, which is introduced between the poles of the voltaic magnet and the crank. Fig. 1 shows it at its greatest extension at the beginning of the stroke. A A are the poles of the magnet connected by means of a keeper B of soft iron. The frame consists of soft iron bars, of which any number are so arranged, that the frame is capable of collapsing, as in fig. 2, at the end of the stroke. These bars may be placed at any distance from each other, but the closer, the more power is exerted. On commencing the stroke the battery circuit around the electro-magnet being completed, the first bar will be attracted, pulling with it the whole frame; when in contact with the keeper it becomes a magnet itself by induction, and attracts the second bar, which in like manner pulls with it the frame and the rest of the bars, which each in its turn is attracted till the stroke is finished, and the crank (the rod in connexion with which is shown at C,) has described half a revolution. The voltaic circuit is now broken by any convenient means in connexion with the engine, and the frame and bars are free to be drawn back to their original position, either by means of the momentum of the fly-wheel, or by means of the action of another reciprocating force exerting its power at the moment when the first ceases. The frame should be mounted on guides, but these are not shown in the figures to avoid confusion.

Yours, &c.,

W. Hislop, jun.,

St. John-street Road, May 14, 1842.